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THE

EXECUTIVE DOCUMENTS

OF THE

HOUSE OF REPRESENTATIVES

FOR THE

THIRD SESSION OF THE FIFTY-THIRD CONGRESS.

1894-95.

IN THIRTY-FIVE VOLUMES.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1895.

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Fifty-third Congress, Third Session.

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53D CONGRESS, 3d Session. } HOUSE OF REPRESENTATIVES. { Ex. DOC. 1, Part 6.

REPORT

OF THE

SECRETARY OF AGRICULTURE;

BEING PART OF

THE MESSAGE AND DOCUMENTS

COMMUNICATED TO THE

TWO HOUSES OF CONGRESS

AT THE

BEGINNING OF THE THIRD SESSION OF THE FIFTY-THIRD CONGRESS.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1895.

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REPORT

OF THE

SECRETARY OF AGRICULTURE.

MR. PRESIDENT:

In compliance with law and custom, the Secretary of Agriculture has the honor now to submit the Annual Report for that Department for the fiscal year ending June 30, 1894. The data, statements, and suggestions contained herein show how much work has been performed, how many people have been employed, what expenses have been incurred, what improvements have been made in the service as to efficiency, and what economies in disbursements have been effected.

A critical perusal of the work of each bureau and division, as herein narrated, will impress the conclusion that, while six hundred thousand dollars ($600,000) have been covered back into the Treasury out of the annual appropriation—the same being 23 per cent of the entire sum set apart for the use of the Department of Agriculture for that fiscal year—economy has not diminished efficiency.

FOREIGN MARKETS FOR AMERICAN FARM PRODUCTS.

During the year the labor of finding where the greatest demand for the surplus farm products of the United States has developed outside of their limits has been persistently and intelligently alert and active.

There is nothing of greater or more vital importance to the farmers of the United States than the widening of the markets for their products. It is the demand for wheat, the demand for beef, the demand for pork, the demand for all the products of human industry which confers a money value upon them in markets. Therefore, the relation of supply to demand is the creator of prices and the sole regulator of values. Holding such views, the Secretary of Agriculture has carefully studied and enumerated the demand for American agricultural products in the principal markets of the world.

THE FARMER'S PRINCIPAL BEEF MARKET.

During the nine months ending September 30, 1894, the farmers and stock-raisers of the United States have sold, and there have been exported, to the United Kingdom of Great Britain three hundred and

five thousand nine hundred and ten (305,910) live beef cattle, valued at twenty-six million five hundred thousand dollars ($26,500,000). During the same period of the year 1893 only one hundred and eighty-two thousand six hundred and eleven (182,611) live beef cattle from the United States were taken by the British markets, at a valuation of sixteen million six hundred and thirty-four thousand dollars ($16,634,000). The small consumption of American beef in England last year was due to restrictions imposed by law, and also to the low prices of domestic beef in England, because of the scarcity there of feeding stuffs, which enforced slaughtering. The increase of the present year does not quite restore the average of the cattle trade between the United States and England. Canada is practically the only competitor with the United States for the English live cattle trade. The regulations governing the importation to England of live stock are the same as to animals from the United States and Canada—no discrimination being made for or against either class. All of the animals are, under the provisions of English law, slaughtered immediately upon arrival at British ports.

Large proportions of the meat thus taken into England are sold in the retail markets of London, Liverpool, and other cities, as "prime Scotch" or "English beef." Under that classification the butcher demands and secures a better price than he could with the meat known and sold as Canadian or American. This method is a splendid indorsement of the quality of American beef. It has, however, been the occasion of much contention, and at last resulted in a Government investigation. The official report of a select committee of the House of Commons on "the marking of foreign meat" was published in August, 1893. It states in the summary, on the evidence taken before the committee, that in "large West End of London" establishments which profess to sell nothing but English and Scotch meats there is practically no other meat than American sold. The committee show that in each case the prices charged were such as would be justified only had the meat been purchased, wholesale, at the price commanded by the best English fattened and killed meat. The conclusions of the committee of the British House of Commons were to the effect that it would be a vexatious and unworkable scheme to attempt to compel the labeling, as to its origin, of each piece of meat offered for sale. The committee suggested that butchers dealing in imported meats should be compelled to register themselves as such dealers, and also pay a fee which might be applied toward defraying the costs of meat inspection. Nothing, however, has been done in pursuance of the recommendations of this committee.

In England it is not believed that legislation can prevent the sale of American and other imported fresh beef as Scotch and English beef. The beef from the United States is of such excellent quality and so very similar to the best English beef that even experts are unable to

distinguish between the two. Any law which might be enacted would fail to repress the sale of American meat in English markets. The statute, however, might curtail the profits of butchers. The lower price which they could only obtain for imported meat, sold as such, would have a direct tendency to increase its consumption, and thus to make more demand for American beef.

The trade in live cattle between the two countries has been of the greatest advantage to the British people. During the six months of the year from March to September, when their cattle are fattening on the pastures, American steers are arriving in large quantities and of superior condition and flavor. Long ago it would have been generally admitted in England that American beef is superior, from March to September every year, to English beef produced during those six months, except for a certain national prejudice which is common to all countries.

During the year regulations have been made which compel the Canadian cattle to be slaughtered at the port of debarkation. These regulations interfere somewhat with the United States beef trade. Formerly Canadian cattle were put in English pastures and fattened. Now, like those from the United States, they must be killed immediately upon arrival. Cargoes of Canadian and American cattle arriving simultaneously at a British port, both being ordered to slaughter at once, would naturally at such times momentarily depress prices. As a rule, Canadian cattle are not equal in condition to ours. They generally bring smaller prices. Canadian distillery-fed cattle, however, are very fine, and command higher figures. At the present moment there are three times as many Canadian cattle being fed at distilleries for export as were fed last year. American shippers may, therefore, look for that competition in the spring. It may not be considered very important, however, as the number will not exceed 20,000 at furthest; but the competition is worth noticing.

The live-beef trade is conducted at different ports with slight differences. At Deptford sales are private on the hoof. At Liverpool half of the animals are sold privately. The other half are slaughtered on account of shippers and sold to buyers by the carcass. The Liverpool surplus makes its way to London, and a large part of it, beyond question, is so "cut up" as to simulate "prime Scotch joints." At Glasgow and Bristol nearly all animals are sold at auction on the hoof. The charges do not differ very materially at the various ports. The following may be taken as the average costs at each place of debarkation: Dock dues, use of slaughterhouse, etc., $1.20 per head; subsistence per day, 24 cents; commission of salesman on each animal, 96 cents; driving (feeding, attending, etc.), 24 cents. The shipper who gets out with British terminal charges of $3.75 per head upon his cattle considers himself fortunate. Add to the above charges, freight $11, and $1.50 for the feed and attendance of each animal on the voyage, and $1.60

for insurance, and we have a total expense for each animal shipped of $17.85. This represents very nearly accurately the expense of getting a beef animal from the American port into the hands of the British buyer.

October 25, 1894, good American steers were bringing in the British market $85 each. The best weight of cattle for shipment is 1,350 to 1,400 pounds, making a dead weight of about 750 pounds. In England the offal (especially in London and Liverpool, where large numbers of poor people purchase it) is considered of great importance. Heads, tails, livers, kidneys, lights, and hoofs go to one buyer, and the hides and inside fat to another. Parliament disinclines toward the encouragement of a trade in dressed meat, because that would shut out the offal. But if the American cattle are killed at home, properly dressed, and sent to Europe in a state of refrigeration, the cost of American beef will be reduced in all those markets. By killing at home and shipping only the dressed carcasses, bulk is compacted, value is enhanced, and the cost of transportation is reduced, so that the poor, who heretofore have bought offal, may be able to buy good meat instead.

During the first six months of the year 1894 there were exported into the United Kingdom of Great Britain one hundred and twelve million (112,000,000) pounds of dressed beef, valued at nearly ten millions of dollars. This trade in dressed beef is almost entirely in the hands of American citizens. Their principal competitors are found in Australasia. The question whether more profit remains with the producer from shipping live beef cattle or carcasses to European markets is one which requires thorough investigation. At the present writing it is deemed probable that more advantage and profit will result to the American farmer from the shipment of dressed beef than from the exportation of live cattle.

European governments are constantly declaring live animals from the United States diseased. These declarations are sometimes made for fear of infection of their own herds, and at other times, it is believed, for economic reasons. If all American beef going abroad is shipped in carcasses, and it is all stamped "inspected" as wholesome and edible, by authority of the Government of the United States, it certainly can not be shut out afterward on account of alleged Texas fever, pleuro-pneumonia, tuberculosis, or any other disease. But if certain European nations continue to demand legally authorized microscopic inspection of American pork and require also veterinary inspection for beef with Government certification to each, then why ought not the Government of the United States to demand that all imports from foreign countries for human consumption—either edibles or beverages—must likewise be certificated by the authorities of those foreign governments as wholesome and unadulterated before they are permitted to be sold in the United States?

AMERICAN HOG PRODUCTS.

Besides consuming such a vast proportion of the beef exported from the United States, the United Kingdom of Great Britain is likewise a voracious customer for American bacon, hams, and lard. Between 20 and 25 per cent of the flesh food of the people of the United Kingdom consists of hog products. About 13 per cent of those hog products comes from other countries, and 14 per cent of the live cattle and dressed beef and mutton is also imported.

There were taken into the United Kingdom from the United States, in 1893, two hundred and forty-three million eight hundred and twenty-four thousand (243,824,000) pounds of bacon, valued at twenty-six million eight hundred and fifty thousand dollars ($26,850,000).

During the nine months ending September 30, 1894, the United States sent into England two hundred and twenty-two million six hundred and seventy-six thousand (222,676,000) pounds, against one hundred and seventy-nine million eight hundred and seventy-two thousand (179,872,000) pounds during the corresponding nine months of 1893. Thus our trade with Great Britain in hog products shows an increase of nearly forty-five million (45,000,000) pounds this year. This, however, does not restore to us the position we occupied prior to the year 1893, as principal purveyor to Great Britain. Nor do the values make as good a showing as they should; for, notwithstanding the increase in quantity, there is a shrinkage in value of half a million of dollars; while the bacon imported to the United Kingdom during the same period increased fifty-six million pounds. The hog products from other countries than the United States did not fall in value proportionally with ours. This is shown by the market quotations throughout the year.

Imports of pig products, beef, mutton, etc., into the United Kingdom during the first nine months of the years 1892–1894.

[From the official returns of the British Board of Trade.]

Product.	Imports for first nine months—			Value of imports first nine months—		
	1894.	1893.	1892.	1894.	1893.	1892.
Bacon:						
From Denmark....cwt..	607,577	542,496	530,814	$8,614,882	$7,988,400	$7,305,375
Germany .....do..	300	9,499	2,987	4,275	141,666	36,546
Canada .....do..	178,878	113,626	189,999	1,790,871	1,415,041	1,763,800
United States..do..	1,988,203	1,606,348	2,295,841	19,357,376	19,857,315	20,031,048
Other countries, cwt	73,542	77,336	53,247	950,712	998,578	677,368
Total	2,848,500	2,349,305	3,072,888	30,717,916	30,401,000	29,814,137
Hams, bulk, United States, cwt.....	887,740	757,609	1,013,044	10,704,687	11,067,636	11,545,579
Beef (salted), United States, cwt.....	178,156	145,422	204,737	1,261,967	947,742	1,425,879

Imports of pig products, beef, mutton, etc.—Continued.

[From the official returns of the British Board of Trade.]

Product.	Imports for first nine months—			Value of imports first nine months—		
	1894.	1893.	1892.	1894.	1893.	1892.
Beef (fresh):						
From United States.cwt..	1,350,635	1,109,396	1,434,813	$13,995,094	$11,958,870	$15,106,349
Other countries, cwt	243,118	223,271	96,784	1,778,705	1,889,774	763,973
Pork (salted):						
From United States.cwt..	107,335	80,965	125,494	853,440	730,400	846,775
Other countries, cwt	59,869	59,514	55,468	398,620	353,980	302,559
Pork (fresh):						
From Holland .....cwt..	77,491	79,515	49,342	888,079	928,950	581,111
Belgium.....do..	16,638	16,159	11,063	203,523	195,642	131,952
Other countries, cwt	15,019	23,844	6,189	196,844	313,474	65,488
Total	109,148	119,518	66,594	1,289,066	1,438,066	778,551
Meat (unenumerated):						
From Holland.....cwt..	83,118	91,204	79,973	882,986	997,222	885,384
United States..do..	21,710	15,784	16,785	195,802	164,549	174,744
Other countries, cwt	33,431	30,626	18,704	386,470	350,913	214,879
Total	138,259	137,704	115,467	1,464,358	1,512,684	1,275,007
Meat (preserved otherwise than by salting):						
Beef .....cwt..	293,044	284,865	399,382	2,874,043	3,292,040	4,320,362
Mutton.....do..	85,069	64,023	47,825	723,779	584,957	465,942
Other sorts.....do..	108,950	99,961	128,169	1,715,507	1,730,786	1,811,602
Total	387,063	428,789	575,876	5,113,329	5,568,783	7,077,906
Mutton (fresh):						
From Germany ....cwt..	7,017	16,335	19,857	83,007	199,269	249,674
Holland.....do..	92,646	98,498	73,902	1,028,625	1,101,809	865,334
Australasia...do..	1,982,519	949,282	796,923	10,226,090	9,292,762	7,945,568
Argentine Republic.....cwt..	424,958	384,297	354,500	3,735,288	3,499,960	3,185,367
Other countries, cwt	58,826	51,531	48,355	637,626	574,009	570,638
Total	1,665,966	1,499,893	1,293,547	15,710,546	14,577,809	12,816,576

NOTE.—Cwt. = 112 pounds.

In the fall of 1893 English bacon was commanding nearly as high prices as in October, 1894. The decline in the best grades of Irish bacon during the same period represents about half a dollar per cwt. (112 pounds). There is some decline in Danish bacon and Canadian bacon. But United States side-meats declined more than $2 per cwt. Cumberland cuts have been reduced by $3, and short-ribs the same amount per cwt. There is also a similarly disproportionate decline in the values in England of United States lard.

Beside the general causes of depression in values of all commodities throughout the world, there is a special reason why values of hog

products should have been lower in Great Britain during the last year. The drought there during 1893 forced their domestic animals upon a glutted market. Thus the price of beef and mutton was brought down to a point where they were preferred as of superior value to bacon and hams. Another cause for the decline in hog products may be found in frozen dressed meats. Excellent mutton can be bought in England at the same price as bacon. Therefore a larger number of people who fifteen years ago seldom ate other flesh than salted swine flesh now purchase New Zealand, Falkland Islands, and other frozen imported mutton. In view of the low prices of meat and other food supplies pouring into England, there have only lately been expressions of surprise in the trade journals there that the prices of bacon are maintained even at present figures. But the British people are a bacon-eating people at breakfast every morning, and no competition of fresh meat is likely to alter their habit in this respect.

The cheaply imported frozen meat largely lessens the consumption of bacon among a numerous class of working people who formerly were exclusively buyers of our hog products which then were the cheapest in the European markets. Thus a great change in their demand for meats—from salt pork to fresh mutton and beef—is one cause of the decline; but there is another reason more potent than this for the comparatively disproportionate fall of the price in the American hog product output throughout the European markets, especially in the United Kingdom. The demand there is for a mildly cured, not oversalted, and very lean bacon. The nearness to market at the point of producing gives to Danish bacon a great advantage. Therefore an astonishing growth of packing houses is witnessed upon the continent, and particularly in Denmark. Danish bacon reaches the English market in twenty-four hours. It arrives in fine condition. It is cured to meet the English taste and demand. The best Danish brands bring within a dollar a cwt. of the best Wiltshire.

Thus a permanent and constantly increasing bacon trade has been built up between Denmark and England, which already amounts to more than fifty million pounds per annum. In October, 1894, Danish bacon is temporarily being diverted by the shortness of the hog crop in Germany from the markets of the United Kingdom. For a long time Germany put a stop by a high tariff duty to the shipment of Danish hogs into its domains. Before that prohibition they were shipped there to be made into bacon; but this year German packers are compelled, by the decline in the swine crop of that country, to import Danish swine and pay the duty thereon, to make up for domestic deficiencies.

What is gained by carefully studying the character of the demand of the foreign markets we seek to supply is well illustrated by the figures given above, showing the relative values and quantities of bacon exported to Great Britain by Denmark and the United States. While the price obtained for Danish bacon is $14.18 per cwt., that obtained

for bacon from the United States is only $9.72 per cwt. In other words, if the quality of the American bacon offered for sale in the British market had been as well adapted to the taste of the British consumers as the Danish, American bacon would have realized $28,192,300 instead of the $19,357,376, which it actually did realize.

The prohibition of American cattle by Germany will stimulate the Teutonic consumption of bacon. Therefore, indirectly, but not the less effectively, it will aid in lessening the Danish bacon capacity to compete in the British market with hog products from the United States.

The best brands of Canadian singed sides bring in England within a half dollar to a dollar per cwt. of the prices of the best grades of Danish bacon, and the Canadians command from a half dollar to a dollar more than the corresponding American cuts will bring. Canada, unlike Denmark, has no advantage over us geographically. Its seeming superiority in quality is due wholly to the fact that its hog carries 10 to 15 per cent more of lean and less of fat flesh than the American hog. It, therefore, more completely answers the taste and demands of the British public, and consequently commands a higher price. The imperious British demand for lean bacon is observed in the unceasing attempts of the great Wiltshire packers to obtain lean hogs. The firm of Charles & Thomas Harris, Limited, of Calne, England (Wiltshire), some time since began to offer a premium for medium-sized pigs. Their system of buying is the issuance of a weekly circular, stating the prices they are willing to pay for certain sorts of swine. A circular of this firm, issued in October, 1894, is as follows:

Present prices for prime pigs, in lots of not less than ten, on rail within 100 miles of Calne.

Prime stores.	Thickness of fat in any part of the back.	Price per 20 pounds.
		s. d.
130 pounds to 190 pounds	2¼ inches and under	7 6
Under 210 pounds	Not exceeding 2½ inches	6 9
Under 230 pounds	Not exceeding 2¾ inches	6 3
Under 240 pounds	Not exceeding 3 inches	6 3

This circular shows that they offered the largest prices for animals running from 130 to 190 pounds which carried not more than 2¼ inches of fat on the back. For such pigs they offered 7*s.* 6*d.* "per score"—that is, in our money, $1.80 per 20 pounds, or 9 cents a pound live weight. Under the Harris plan of purchase it is reported that the percentage of lean pigs sent to the Calne market in Wiltshire has risen from 47 to 75. The public demand for this sort of bacon has been met by the farmers by changing the breed. To do this they have raised Tamworths and Yorkshires to the exclusion of the Berkshires. The methods of this firm of English packers are enlarged upon for the reason that Wiltshire bacon is all through Europe recognized as the standard brand, and the house of Charles & Thomas Harris is known as the largest and

best Wiltshire packing concern. Therefore a knowledge of the methods which they pursue to maintain their goods in public esteem is in the highest degree valuable to the American packers and farmers. The fact is demonstrated that the bacon which commands the best price in the English market is a lean and not over-salted meat. In view of that fact, it is of interest to American producers to place themselves in a position to cater especially for a market which demands so much of this peculiarly fattened and particularly cured commodity.

The English lard market italicizes the fact that complaints from retail dealers throughout England are constantly being made, through their trade journals, regarding the short weights of American lard in pails. A prominent London trade journal of October 13, 1894, says:

The result of carefully weighing 50 wood pails of a well-known American, bought, as usual, at shippers' weights and received by us about a fortnight ago, shows that the exact weight in each pail (each lid bearing the words "28 pounds net") was as follows: 11 pails weighed 27 pounds 2 ounces each; 12 pails weighed 27 pounds each; 3 pails, 26 pounds 14 ounces each; 15 pails, 27¼ pounds each; 2 pails, 27 pounds 6 ounces each; 1 pail, 26 pounds 10 ounces; 2 pails, 27½ pounds each; 1 pail, 27 pounds 10 ounces; 3 pails, 26¾ pounds each, making a shortage of 44 pounds on the lot. Retailers in England are combining against short lard weights generally, and there is a movement in some of the larger trade centers looking to the same end. The result may be a discrimination, amounting in many places to a boycott, against all brands which do not weigh out as marked.

The foregoing somewhat tedious details as to the meat trade of the United States with the United Kingdom of Great Britain have been secured by personal solicitation of the Secretary of Agriculture, and are perfectly reliable down to and inclusive of the first nine months of the year 1894. They accentuate the magnitude of that particular foreign market for surplus meat products of the farmers of the United States.

Worthington C. Ford, the very competent and diligent Chief of the Bureau of Statistics in the Treasury Department, has furnished the Department of Agriculture the following table, which represents the quantities and values of bacon, hams, pork, etc., shipped into the United Kingdom from the United States during the year ending June 30, 1894:

Product.	Quantities.	Values.
	Pounds.	
Bacon	334, 985, 389	$31, 366. 843
Hams	73, 894, 248	8, 230. 787
Pork, fresh and pickled	14, 272, 957	1, 159, 315
Lard	150, 655, 158	13, 528, 987

To Mr. Ford the American public is indebted for valuable statistical data further illustrative of the foreign markets and the amount of American farm products which they consume. In his summary statement of the imports and exports of the United States, corrected to March 1, 1894, it will be seen that during the seven months ending January 31, 1894, the United Kingdom of Great Britain took fourteen million

eight hundred and thirty-eight thousand three hundred and sixty-seven dollars' ($14,838,367) worth of live cattle from the United States, while all other countries took during the same period of time only two hundred and thirteen thousand eight hundred and fifty-five dollars' ($213,855) worth. During the one month of January, 1894, the United Kingdom of Great Britain took from the United States thirty-five million two hundred and forty thousand four hundred and thirty-one (35,240,431) pounds of bacon. The balance of the world took during the same time nine million five hundred and seventy-six thousand seven hundred and seventy (9,576,770) pounds. On page 565 of the summary statement referred to, under the head of "Domestic breadstuffs, etc.," exported from the United States, is a recapitulation showing the amount of breadstuffs, provisions, cotton, and tobacco exported from the United States by all countries during the year ending December 31, 1893.

This recapitulation shows that the United Kingdom paid to American producers during that year for breadstuffs, provisions, cotton, and tobacco more than three hundred and twenty-four millions of dollars ($324,000,000). That is to say, *the British market bought more than one-half of all the farm exports of the United States during that year.* Including mineral oils with agricultural exports (and there was only $10,131,473 worth of oil shipped), the United Kingdom of Great Britain took 54.31 per cent of all that was exported from the United States during that year. And the entire exports of breadstuffs, provisions, mineral oils, cotton, and tobacco from the United States to all parts of the world during that year aggregated six hundred and fifteen million five hundred and seventy-four thousand and eighty-six dollars' ($615,574,086) worth in value. A study of the world's markets demonstrates the fact to the producers of meat and breadstuffs in the United States that the United Kingdom of Great Britain furnished the largest demand for their commodities.

Besides taking so much of meat and breadstuffs the same country took, in the year ending September 30, 1894, one hundred and forty-one thousand two hundred and ninety-four (141,294) tons of hay from the United States; but, owing to the fine hay crop which has recently been secured in Great Britain, there will be a great falling off in this respect for the coming year.

Great Britain took thirty-one thousand five hundred and twenty (31,520) tons of cheese from the United States during the year which ended April 30, 1894, and of butter, for the same period, two thousand and twenty-one (2,021) tons. But Denmark furnished, in butter, in the same year to Great Britain, forty-eight thousand nine hundred and ninety-seven (48,997) tons. From these dairy figures one may reasonably conclude that the butter and cheese capabilities of the United States are only just beginning to be developed.

One of the lessons of this competition, especially accentuated by the conditions of the foreign dairy market, is that *quality* must be the

constant aim of the producer. Upon that Denmark has founded and developed her wonderful foreign dairy trade. As a producing country, competing against all the world in the world's markets, the high quality and integrity of our products must be firmly established and strictly maintained. Such a reputation is indispensable if we are to hold our place in the markets of the world.

WHEAT IN ENGLISH MARKETS.

The United Kingdom took in from foreign countries during the nine months ending September 30, 1894, nine million (9,000,000) bushels more wheat than during the same months in the year 1893; but the increased shipments into England of wheat were principally from Russia, the Argentine Republic, and Australasia. During that time the United States did not maintain its position as a wheat-seller in England. In those nine months there was a falling off in American wheat upon the English markets of thirteen and a half million (13,500,000) Winchester bushels. The decline in value was proportionately far greater, and amounted to eight million four hundred and thirty-three thousand dollars ($8,433,000). A primary cause for the falling off of American wheat in English markets during the early part of this year is found in the fact that Argentina was a free seller, while our people maintained figures a trifle above the British market. On October 25, 1894, the market appears more inclined to higher figures. There is a distinct indication of activity and a better trade, with, however, only slightly improving prices. Appended hereunto is a table showing the prices of American and British wheat, and English barley, and beef and potatoes, during each month of the year 1894 down to and inclusive of September 28.

Prices of certain food products in Great Britain on the first day of each month (or thereabouts) of the year 1894.

Date.	American red winter wheat (per Winchester bushel).	English wheat (per Winchester bushel).	English barley (per bushel of 56 pounds).	Beef, inferior (cash wholesale, per pound).	Beef, superior (per pound).	Potatoes (per ton).
1894.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	
January 5	77	76	88½	7½	14½	$14.60
February 2	78	76	88½	7	13½	12.77
March 2	77	70	85	6	13½	12.16
April 1	70	70	82	7	12⅝	10.33
May 1	75	71	86	7	13½	7.39
June 1	66	70	73	7	13⅝	9.73
July 1	64	70	62	8	13⅝	12.16
August 3	66	71	68	7	13⅝	*17.03
August 31	62	70	68	7	13⅝	15.78
September 28	57	57	71	7½	12⅝	17.00

*New.

NOTE.—These averages are official. In the original tables the figures for *red winter wheat* are expressed in sterling money per quarter of 496 pounds. These are translated into United States equivalents at the par value of the pound sterling (4.86\frac{65}{100}$) and in bushels of 60 pounds each. *English wheat* has for its unit the quarter of 504 pounds; English *barley*, the quarter of 448 pounds; flour, the sack of 280 pounds; beef, the London stone of 8 pounds.

These tables are of value to the American farmer. They illustrate the fact that the price of wheat is now, and must always be, governed by the relation of the supply of wheat to the demand for wheat. Improved farming implements and machinery have reduced the cost of production. Wheat will, in all probability, remain at relatively low figures in all time to come, except when there are failures of the crop in large wheat-growing sections of the earth. The great competitors of the United States in the production and sale of wheat are the Argentine Republic, Australasia, and Russia. The capabilities of the last-named country as a bread-producer are beyond computation. Already American farm implements and machinery are finding enormous sale in that Empire, and permanently established agencies of the great reaping and other manufacturing concerns of the United States are solidly located at Odessa and other important entrepôts to the wheat-growing regions.

Looking at cheap bread from the standpoint of the consumer, the world is fed better and oftener than it ever was before. The profits of the producer are now divided, so that the consumer gets a large share thereof. But it matters very little to the producer of wheat in the United States what the price may be if he is permitted to buy in the markets where he is compelled to sell. In other words, if the price of the farmer's wheat is fixed in Europe, there is no good reason why the prices of the things he has to buy should not also be fixed in Europe. In *selling*, the farmer competes with all the world. To give him an equal chance he ought also to be allowed to *buy* where all the world competes. European and all other foreign markets for wheat indicate that the competition in that cereal is constantly increasing and intensifying. The Argentine Republic is capable already of placing thirty-five millions (35,000,000) of bushels of wheat a year on the European market, while it has only five millions (5,000,000) of population. The Argentine wheat fields average less than 100 miles from deep-water harbors. To reach shipping ports Argentine wheat pays no appreciable inland freight. But the wheat of the United States averages quite a heavy transportation charge in reaching the seaboard. In short, we have a long haul and the Argentine Republic a short haul before reaching the Atlantic. Russia, likewise, has the advantages of a short haul and speedy transportation.

There are many subsidiary crops to which the American farmer may profitably turn his attention. Wheat will not hereafter be our staple cereal product. Corn is constantly advancing in importance, because of an ever-growing demand for that cereal, which is evolved from the various new uses to which it is being constantly appropriated.

EXPORTS OF BARLEY.

There has been a steadily growing demand for barley exportation to Great Britain. This demand amounted during the first nine months of 1894 to an increase over last year of eighteen millions (18,000,000) of

bushels. The universal use of barley by brewers in England maintains a steady and constant market for the highest grades of that cereal. Hard, firm, and bright grain barley from the Northwestern States and California commands higher prices than many European barleys. That kind of American barley is second best to the best grade barleys of Smyrna, and is regarded among the best malting barleys in the British markets. The average yield, per acre, of barley in Great Britain is thirty-four (34) bushels, though the drought of 1893 reduced it to an average of only twenty-nine (29) bushels. There are two and a quarter million (2,250,000) acres, average, of barley in the United Kingdom annually, so that the annual product is something like seventy-five million (75,000,000) imperial bushels, though the harvest of 1893 shows only sixty-five million seven hundred and forty-six thousand (65,746,000) bushels.

In seven years the export of barley from the United States to Great Britain has grown from nothing into a very considerable trade. The average price in England during the year 1894, of good, bright barley, per bushel of 56 pounds, has been 77⅛ cents.

The supply of the best quality of malting barley is limited, but there are States in the American Union which have great advantages for the production of the very highest grades of this cereal, and the market seems to be a growing one into which American farmers can pour a large volume of remunerative products every year.

THE UNITED STATES APPLE TRADE WITH ENGLAND.

During the year 1892 England took in from the United States and Canada four and a half million (4,500,000) bushels of apples, valued at six and a half million dollars ($6,500,000). In the year 1893, however, owing to poor crops in this country and Canada, and not because of a want of a market in England, she purchased only three million four hundred thousand (3,400,000) bushels, valued at four million one hundred thousand dollars ($4,100,000); and during the nine months ending with September, 1894, Great Britain took one million nine hundred thousand (1,900,000) bushels of apples, valued at two and a half million of dollars ($2,500,000). The apple market in Great Britain during the spring is largely supplied from Australasia, New Zealand, France, and Italy, the import from the latter country being a novelty which was witnessed for the first time during the year 1894.

The English apple crop is gathered in the early autumn and partially supplies the markets until about the middle of September. Then the first shipments of American apples begin to arrive. They consist of summer fruit. They are very tender and require immediate sale. They are packed in what are known to the trade as "New York barrels," containing 3 bushels and running 1 cwt. in weight. These barrels are smaller by 25 pounds than those in which the Canadian apples reach that market. But it is rather an advantage to the American trade that

the barrel is smaller. It is not believed in Great Britian that if the barrel was made larger the corresponding increase in price could be obtained.

Canadian apples begin to arrive in London at the end of October. As a rule they are firm, hard, and fine colored, and command the best prices through the winter. American apples average, at wholesale, $2.25 to $3.15 per "New York barrel," while the Canadian brings $2.91 to $3.87 per "Canadian barrel." The 1894 apple crop of England is exceptionally small, owing to a late frost in the spring. The market for American apples will be good throughout the entire coming winter. It is important that the shippers understand that only choice fruit will pay profit on shipments. It is equally important that the apples be carefully handled and properly packed.

There is also a good demand in England for high-class cider, and there is no reason why the American farmer should not export in this form the apples not properly conditioned for shipment. At the present time English cider is selling at 22 cents per gallon, with a prospect of commanding 25 cents during the greater part of the winter.

EXPORTS OF HORSES.

There is a growing demand in England for American horses. During the first nine months of the year 1894 the English market took two thousand eight hundred and eleven (2,811) American driving horses, at an average value of $139 per head. Last year the average price of those shipped was $230. A sound light draft horse, in good condition, of the size and weight adapted to omnibus work in cities, will generally bring, in Liverpool or London, $150. Nearly all of the shipments of horses thus far from the United States to England have been through English buyers. Arriving in England, the animals are put out to grass, as a rule, for a month at least, and are then sold at auction. Canada has about an equal share with ourselves in the English horse market, although Canadian shipments have the reputation of being somewhat better in quality.

The average price of Canadian geldings during the last nine months has been $160, as against $139 for American. The English understand perfectly well that prices of horses have fallen in the United States on account of the extensive substitution of trolleys and bicycles for horses, and it is generally conceded that a considerable demand for American horses will soon spring up throughout Europe. The great omnibus and tramway companies of London are recruiting their stocks from the United States and Canada very generally at the present time.

POTATOES.

The British acreage in potatoes has not varied materially from half a million acres during many years. In Ireland the acreage has gradually fallen, in the course of fifteen years, from eight hundred and forty-

two thousand (842,000) acres to seven hundred and twenty thousand (720,000) acres. The potato product of the Channel Islands, France, and Belgium amounts to about three million (3,000,000) cwt. every year. But during the year 1894, up to and inclusive of the month of May, a considerable shipment of potatoes was made from England to the United States. When those shipments were made, potatoes were selling in New York for $2.25 per sack of 168 pounds, and the price in England was $7.29 to $12.15 per ton of 2,240 pounds. In October, 1894, potatoes were selling in New York at $1.85 per sack of 168 pounds, while the prices ranged in England at from $14.60 to $17 per ton.

The cost of transportation for potatoes from Great Britain to the United States per ton is about as follows: Drayage to the ship, 60 cents; freight, $3.03; sacks, $1.80. To these figures must be added insurance, duties, and commissions on this side. The duty is put on to protect the "infant industry" of potato-growing in the United States. It is supposed to make higher prices for those Americans who raise potatoes, and lower ones for those who eat them. A protective tariff is always depicted by its advocates as a dual blessing to the farmer, so adjusted as to always enhance the things he sells and cheapen the things he buys. However, English potato dealers do not look to the New York market for sales until prices there reach about $2.25 per sack. The potato crop of England this year is so limited that we shall not be able to draw supplies from there, even at higher prices than were obtained last year.

THE ASSISTANT SECRETARYSHIP.

On January 1, 1894, the Hon. Edwin Willits retired from the office of Assistant Secretary of the Department of Agriculture. He remained, by request, up to that date, so that he might complete satisfactorily his arduous duties in connection with the Government's exhibit at the World's Fair. The sense of obligation which the Secretary is pleased to cherish for Mr. Willits, because of his many good services to the Department, is hereby very frankly acknowledged, and a sincere admiration for his rugged honesty, industry, and vigilance, as an official and efficient friend of agriculture during his entire connection with this administration, is unconcealed.

On the same date, Dr. Charles W. Dabney, jr., president of the University of Tennessee—who had previously been selected by the President and confirmed by the Senate as Assistant Secretary of Agriculture—entered upon the discharge of his duties. During many years this gentleman had been prominently and intimately identified with agricultural education. He had especially prepared himself in that line of study, by severe application in the laboratories of this country and in Germany. His experience as a State chemist, as director of an agricultural experiment station in North Carolina, and as president of the Universtiy of Tennessee, brought him to his present

position peculiarly well equipped for the discharge of its responsible duties. Therefore, on the 2d day of January, 1894, the Secretary of Agriculture issued a special order wholly revising the duties of the Assistant Secretary. That order assigned to him the entire direction of all the scientific divisions, and likewise of the Office of Experiment Stations, of the Office of Irrigation Inquiry, of the Office of Fiber Investigation, and of the Museum. Himself a scientist, Dr. Dabney has discharged the duty of supervising the expenditures and controlling the direction of scientific research, operations, and policy with admirable judgment and skill.

The application of science to agriculture, under his management, is becoming, through practical bulletins published by the Department and other popular means, more generally appreciated, understood, and approved.

During the year the Department has entered upon two new lines of very important investigation. The first of these relates to grasses and forage plants.

AGROSTOLOGY.

The forage interests of the United States are vast in value. Seventy million (70,000,000) tons of hay are cut and cured each summer. This crop is taken from fifty million (50,000,000) acres of land. Each year's hay crop is estimated to be worth six hundred millions of dollars ($600,000,000). No accurate means have been found for ascertaining the cash value of grasses upon pasture and other lands that are grazed. It is known, however, that those lands support and fatten vast herds of cattle, sheep, and horses. In 1890 such ranges in the United States fed fourteen million fifty-nine thousand and thirty (14,059,030) head of domestic animals. As these millions of animals subsist largely upon native grasses and other forage plants, the magnitude of these figures elucidates the vital necessity of securing, if possible, new and better grasses and forage plants in this country. Therefore the Department of Agriculture has undertaken the development of a Division of Agrostology. The gentleman in charge of this new line of investigation, Prof. F. Lamson-Scribner, has a national reputation. His appointment was made upon the recommendation of many of the best botanists in the several universities and colleges of the United States.

At present agrostology is merely an agency in the Division of Botany. It is the duty of the expert in charge of this agency to study grasses and forage plants in general and to instruct and familiarize the people of this country, through bulletins and leaflets, with regard to the conservation of the native grasses of the continent, and to teach them how to introduce from foreign countries such improved and useful forage plants as may be found adaptable and profitable in the United States. It will be his especial and specific duty to prepare and publish a work on "the forage plants of the United States," and subsequently a more

elaborate publication, "Handbook of grasses of the United States." This will contain descriptions and illustrations of all the known grasses of this country.

Through the Department of State the Secretary of Agriculture has secured the assistance of all the consular agents of the United States in collecting at their several stations or posts of duty any seeds of forage plants. These specimens and seeds are forwarded directly to this Department and submitted to Prof. Scribner for examination and testing. Thus it is proposed to search the whole civilized globe for grasses and forage plants which may be of value to the people in each section of the United States. It is hoped that in this way the quantity per acre of the hay crop of this country may be very materially increased and its quality improved. If, however, the hay production per acre in the United States is, as a result of this effort in behalf of agrostology, raised only 1 per cent, it is equal to an increase of six millions of dollars per year in the value of this single farm product. Prof. Scribner's investigations have already reached such proportions, and they promise to become of such inestimable value to the farmers of the United States, that it is proposed to create a new division in this Department, as provided in the estimates herewith submitted, to be called "The Division of Agrostology."

AGRICULTURAL SOILS AND CROP PRODUCTION.

The second new line of investigation relates to agricultural soils and crop production. Such soils have long presented a problem unsolved by chemical analysis. It has been known for some time that the peculiarly valuable characteristics of different agricultural soils are often due to some other cause or causes than the chemical composition. Climatic conditions are potent in their influences as to the general distribution of plants, but they alone do not explain why one soil is well adapted to one variety of crop while the soil in an adjacent field, receiving the same amount of rainfall and heat, is wholly unadapted to it while perfectly adapted to an entirely different crop requiring an altogether different nutrition.

Records of climatic conditions generally end at the surface of the earth. But the farmer's interests are equally connected and concerned with the climatic conditions within the soil and below the surface of the ground.

The amount of sand, silt, clay, and organic matter contained in soils so modifies the atmospheric conditions that different soils maintain very different degrees of moisture and temperature for plant life. Different varieties of plants require different degrees of moisture and heat for their best development. Thus each class finds the conditions best adapted to its peculiar nature in different kinds of soil. Wheat requires a low temperature. Corn requires a relatively high tempera-

ture. Celery and rice develop best in moist soils. Sweet potatoes and peanuts require a comparatively dry, sandy soil.

Deeply tilled soils provide a large reservoir for the rainfall. The deeper the soil is stirred and cultivated, the larger the reservoir. The texture of the soil—that is, the relative amount of sand, silt, clay, and organic matter which it contains, and the way in which these constituent grains are arranged—determines the amount of water which the soil may retain from rains. Sandy soils retain comparatively little water, because they afford little resistance to percolation of the rainfall. Through them the water leeches down beyond the reach of vegetation, and is lost to plants. Such soils are naturally adapted to the forcing of early "truck" and vegetables, and to such plants as are grown for fine texture and bright-colored leaf development.

Soils having a great amount of clay in their composition offer great resistance to the rainfall. The movement of moisture downward through such soils is exceedingly slow, and thus an abundant humidity is generally retained; this adapts them to the growth of wheat and pasture grasses that need an abundant supply of water for their growth. On such soils tobacco also grows strongly, throwing out heavy leaves which contain a great amount of oil and gum, developing a character of tobacco adapted to an entirely different purpose from that grown from the same seed in lighter soils.

Considerations like these led this year to the establishment of a division in the Weather Bureau for the study of meteorology in its relation to soils. Prof. Milton Whitney, who had previously been in the service of the Department as a special agent engaged upon these investigations and had made a marked reputation by his careful and original work, was appointed chief of this division.

Observations have been made during the past season on the conditions of moisture and heat in the typical soils of the "truck" area of the Atlantic seaboard and in several of the soil areas adapted to the different types of tobacco, and likewise in the soils of the arid regions of the West.

These observations have shown the cause of the peculiar value of "truck" lands. They have indicated also large breadths of land similar to them which are at present practically abandoned, although well adapted to the important and oftentimes very lucrative industry of raising early vegetables for the markets of our great cities. Investigations have shown the reason for the differences in the type of tobacco grown in several of the most important tobacco regions. They have explained why certain types of land in the several regions are not adapted to the varieties of tobacco demanded by the present domestic and foreign markets. They have demonstrated this, and also suggested how the conditions of these lands may be changed to render them productive of a demanded grade of tobacco.

From the careful examination thus far made of the soils of the

so-called arid regions of Kansas, Nebraska, and Colorado, Prof. Whitney is convinced that, with their present climate, and with improved methods of thorough preparation and deep cultivation, and with a careful selection and modification and rotation of crops, they may be vastly improved in the certainty and constancy of their agricultural productiveness. Prof. Whitney does not claim, however, that deep subsoiling alone can wholly obviate the necessity of irrigation, but he impresses the fact that irrigation is always expensive, and that there are vast areas of arid lands which can never be irrigated nor profitably farmed under existing methods.

The time is not remote when in all the arid and subarid regions of the Northwest deep subsoil tillage will be regarded as the only probable certain assurance against the loss of crops in long-continued drought. The farmers in these regions must soon come to understand that the deeper, in plowing, the soil and subsoil is stirred, with subsequent deep tillage of corn or root crops during the summer, the greater the capacity for the storage of the rainfall and the less the liability of crop failure. Especially will this be demonstrated in the soils and subsoils of Kansas, Nebraska, and the Dakotas, where there is so much of silt and so little of sand in the lands.

When the conditions essential to the proper development of particular kinds of crops are perfectly understood and established, these investigations will supply the basis for a more intelligent use of water. It is now the intention of the U. S. Department of Agriculture to have the texture and physical conditions of the principal agricultural soils of the American Union thoroughly examined. Thus it will establish among the people the knowledge of the necessary conditions for the maintenance of crops. When the conditions in these typical soils are understood, they will be the basis for comparison with other soils. Such comparison will show what class of crops each soil is fitted for and how soil conditions may be changed to adapt it to any particular crop for which the general climatic conditions seem favorable.

As a basis for this work, a vast amount of material, consisting of nearly two thousand samples of soils, which have been collected with skill and judgment from all parts of the United States, is in possession of the Department.

In consideration of the vast importance of this work, the Secretary of Agriculture recommends that this division be taken out of the Weather Bureau and established as an independent division in this Department. Estimates have been submitted in accordance with this plan.

WEATHER BUREAU.

The administration of the Weather Bureau during the fiscal year ending June 30, 1894, cost fourteen (14) per cent less than the appropriation made for that period of time. The financial history of the

Weather Bureau service is clearly set forth in the appended tabulated statement, which begins with 1882 and closes with 1894, as follows:

Fiscal year ending June 30—	Amount appropriated.	Amount expended.	Deficiency.	Amount returned to Treasury.
1882	$988,615.80	$988,615.80	.....	.....
1883	993,520.00	993,520.00	.....	.....
1884	958,034.57	984,451.30	$26,416.73	.....
1885	954,517.88	966,076.44	11,558.56	.....
1886	955,740.80	960,812.06	5,071.26	.....
1887	892,290.42	902,042.67	9,752.25	.....
1888	887,503.85	909,410.74	21,906.89	.....
1889	845,896.27	853,396.27	7,500.00	.....
1890	801,122.59	810,622.59	9,500.00	.....
1891	813,046.53	877,659.80	64,613.27	.....
1892	889,753.50	* 830,783.33	.....	* $55,000.00
1893	908,595.50	* 892,805.20	.....	* 15,000.00
1894	951,100.00	* 812,711.60	.....	* 138,500.00

* Estimated—accounts not yet permanently closed.

This statement shows that for the year 1894 one hundred and thirty-eight thousand five hundred dollars ($138,500) of the appropriation was covered back into the Treasury—an amount of money aggregating nearly twice as much as all the moneys covered back into the Treasury from that Bureau in the preceding eleven years. It is agreeable to state, also, that the Chief of the Weather Bureau reports the reduction in expenditures to have been made without impairment of the efficiency of the work of the Bureau.

PROMOTIONS.

Important positions in the Weather Bureau were filled during the past year by competitive examinations. Some examinations were freely thrown open to all citizens. Others were only accessible to those in the lower grades of the Weather Bureau whose service ratings were the highest. The results of this competitive system have been exceedingly satisfactory. The introduction of this manner of promoting subordinate officials has been an inspiration to all the Weather Bureau observers to do their very best as forecasters. Examinations have been held for forecast officials. Doubts entertained by many heretofore, as to whether capacity in forecasting might be satisfactorily tested by examinations, have been dispelled. The Weather Bureau itself has conducted the examinations, because this method of securing suitable persons for forecast duty was altogether experimental.

PUBLICATIONS.

During the year the Weather Bureau issued two million six hundred thousand (2,600,000) weather maps outside of Washington, and two

hundred and twenty-nine thousand one hundred and twelve (229,112) within the city's limits. During the same period of time the Bureau issued seventy-one thousand two hundred and sixty-six (71,266) Weather Crop Bulletins.

The observations on the general subject of publications under the head of Division of Records and Editing, regarding gratuitous distribution, apply with peculiar force to the publications of the Bureau.

FORCE AT THE CENTRAL OFFICE.

During the year there was a complete reorganization of the force in the Washington office of the Weather Bureau. In that time fifty-eight (58) persons, whose salaries aggregated fifty-four thousand seven hundred and fifty dollars ($54,750) per annum, were taken from the pay rolls of that office. During the same period forty-five (45) persons, whose salaries amounted to thirty-six thousand seven hundred and seventy dollars ($36,770) per annum, were added to its pay rolls; thus lessening by thirteen (13) the number of persons employed, and reducing their annual pay roll seventeen thousand nine hundred and eighty dollars ($17,980). The entire number of persons on the pay rolls of the central office, June 30, 1894, was one hundred and seventy-one (171). Their salaries amounted to one hundred and seventy-eight thousand seven hundred and thirty-one dollars and sixty cents ($178,731.60) per annum.

FORECASTS.

Regular forecasts of weather, wind, and temperature have been made from the 8 a. m. and 8 p. m. observations and furnished to the press associations, telegraph companies, and newspapers throughout the United States. For forty-five (45) separate districts, covering the entire country east of the Rocky Mountains, these forecasts have been made. They are for periods each usually of twenty-four to thirty-six hours, respectively; but for longer periods when conditions seem to indicate such a necessity.

Storm warnings have been wired often to the lake and seacoast stations, and to the director of the Canadian Meteorological Service at Toronto. Warnings of frost to fruit, tobacco, and cotton regions, and warnings of severe local storms, cyclones, cold waves, northers, and dangerous floods have been frequently sent to threatened districts. Such admonitions are issued whenever conditions indicate the necessity for them.

VALUE OF THE WARNINGS.

During the year the Weather Bureau warnings received, as a rule, wide distribution. There were very few disastrous storms of which the people had not been apprised twenty-four to thirty-six hours in advance of their culmination during the last summer. The severe

cyclones of August 25 to 27, and October 12 to 14, 1893, were notably well foretold. The warnings given for those dates italicized the value of the service to agriculture and to commerce.

During the year much inquiry was elicited as to the probable value of the forecast work of the Weather Bureau. It is difficult to estimate with any degree of precision or accuracy the real value of the current work of the Weather Bureau. It, however, affects almost innumerable interests. It varies from day to day in its influence upon, protection over, and conservation of, those multifarious interests. Directors of the State weather service in Ohio and in North Carolina report—the first a saving of two hundred thousand dollars ($200,00 0) by the warning of January 24, 1894; the latter estimated that during the season two hundred thousand dollars' ($200,000) worth of farm products in his immediate territory was saved from frost by the same means. These estimates are conservative. They only hint at the vast possible value each year of the forecast work and warnings throughout the United States.

In January, 1894, the Steamship *Rappahannock* was stranded, and the nearest Weather Bureau observer, at Cape Henry, Va., immediately telegraphed a wrecking company at Norfolk to the effect that unless the stranded steamer lightened up enough to float at high tide on the night of the 24th she would be broken to pieces by a coming storm upon the rocks. The observer's message was communicated to the *Rappahannock* by flag signals. This warning caused the wrecking company to exert themselves to the utmost and they consequently discharged a sufficient cargo to enable the vessel to float that night at 10:35, and at 12:45 a. m. of the next day—that is, twelve hours and ten minutes after the vessel was floated out of danger, because of the Weather Bureau warnings—an intensely severe westerly to northerly gale (which had been forecasted) with freezing temperature, rain, and a heavy sea set in; and it is generally conceded that, had the vessel continued aground until that storm struck her, she would have been pounded to pieces and, with her cargo valued at six hundred thousand dollars ($600,000), proved a total loss.

The September tropical storm of 1894 was forecasted with great accuracy and exactness. Warnings were sent very generally along the Atlantic coast. Because of the admonitions of the Weather Bureau relative to that particular storm one thousand and eighty-nine (1,089) vessels, valued at seventeen million one hundred thousand four hundred and thirteen dollars ($17,100,413), were retained in port. During the October tropical storm of 1894 one thousand two hundred and sixteen (1,216) vessels, valued at nineteen million one hundred and eighty-three thousand five hundred dollars ($19,183,500), were prevented from going out to sea because of the warnings issued by the U. S. Weather Bureau. The value of the cargoes in all this multitude of ships which were prevented from encountering the tropical storms

of September and October has not been estimated. It is, however, reasonable to presume that the cargoes were worth much more than the ships, and therefore safe to assume that the Weather Bureau warnings for the two months, which kept in port vessels valued in the aggregate at thirty-six million two hundred and eighty-three thousand nine hundred and thirteen dollars ($36,283,913), also preserved from the perils of those most disastrous and far-sweeping storms several million dollars' worth of merchandise, commodities, and other property in transit.

Besides that vast amount of value in materials, many human lives undoubtedly were preserved from jeopardy and death. The records of those vessels which disregarded the warnings of the Weather Bureau in those two storms show that they suffered severely or were utterly destroyed. The owners of the vessels remaining in port because of the Weather Bureau admonitions plainly say that, but for those warnings, they might have been lost.

It is not practicable to estimate the value of the warnings to agriculture and inland commerce up to this time. But data are being collected by the Weather Bureau which hereafter may be of great service in elucidating the value of its warnings to farmers shipping perishable fruit and root crops in the autumn and spring, as well as to those middlemen who handle such products.

Facts and figures have been quoted sufficiently in the foregoing to prove that the Weather Bureau, when it is properly and efficiently administered, may save to the American people, by its forecasts and warnings, many millions of dollars each year. And as the utmost expenditure for the maintenance of this Bureau at this time is less than one million of dollars annually, the investment is apparently a paying one for all the people. This outlay of money may therefore come properly within the functions of the Government, because it is in the line of protection to property and life.

By recent arrangement with the Postmaster-General, the warnings have been extended by the Post-Office Department to 3,608 more distributing points east of the Rocky Mountains, and thus a greatly increased number received warnings of the tropical storms of September and October above mentioned. The actual saving of property from jeopardy by the admonition of those two months is beyond computation.

The extracts from reports of observers concerning the value of the forecasts and warnings received from the Weather Bureau in connection with the September and October storms of 1894 will be published in the full report of the Weather-Bureau Service over the signature of that eminent forecaster, Maj. H. H. C. Dunwoody, in his transmittal of statements to the Chief of the Weather Bureau, showing the forecast work of his division in regard to the prenamed storms.

THE WEST INDIES CYCLONE SERVICE.

This service is continued from July 15 to October 15 each year. Reports are rendered by telegraph and mail from Santiago, San Domingo, St. Thomas, and Kingston. At all these points the U. S. Weather Bureau maintains paid observers. During the hurricane season observations are taken twice each day. They are wired to the United States observer at Key West whenever an unusual meteorological perturbation occurs. All approaching storms are also heralded from the West Indies stations. Voluntary telegraphic reports are received by our observers at Jupiter and Key West, respectively. When of interest they are telegraphed to Washington also from Nassau, New Providence, the Bahama Islands, and Havana. This work is carried on by the coöperation of the governor of the Bahama Islands and the superintendent of the central office of the Meteorological Marine Service at Antilles, Havana.

The attempt has been made by personal interview and correspondence to secure the voluntary coöperation of the Rev. Lorenzo Gangoite, S. J., of Belen College, Havana, and members of the Jesuit Order in Balize, Yucatan, in rendering reports of hurricanes to the U. S. Weather Bureau. So far the Bureau is much indebted to the Rev. J. T. Hedrick, S. J., of Georgetown College, Washington, D. C., for kind offices in this connection. The commercial importance and great need of reports from Yucatan can not well be overestimated.

TELEGRAPH SERVICE.

The service rendered the Weather Bureau by telegraph companies during the year has been reasonably prompt and generally efficient. The best record of telegraphy in this service was made on the morning of April 6, 1894, when all reports due in Washington at the central office over circuits and by special message were received by 9 a. m., that is, just fifty-four minutes after the time of filing. Not a single report was missing. These reports, be it remembered, embraced observations made at 126 stations. They covered the continent from the British Possessions to the Gulf. They reached from the Atlantic to the Pacific.

During the year a reduction in the cost of the regular "circuit" business of about 15 per cent was effected. This was accomplished by revising and reforming contracts of the preceding year. The total expense for telegraphing (May and June estimated) was one hundred and forty-six thousand one hundred and forty-seven dollars and forty-eight cents ($146,147.48), that is, forty-three thousand eight hundred and fifty-two dollars and fifty-two cents ($43,852.52) less than the allotment. That is a saving of twelve thousand and fifty-two dollars and sixty-six cents ($12,052.66) by reason of reduced telegraph rates. Furthermore, by readjustment of the rates for local forecast and

cotton-region messages an additional saving of about four thousand dollars ($4,000) will result to the Bureau during the current year.

Public appreciation of the warnings of the Weather Bureau and the growing importance attached to their value are very well illustrated in a recent suit against the Pennsylvania Railroad Company for the value of a canal boat wrecked during the storm of August 24 and 25, 1894. The lost boat broke loose from a Pennsylvania Railroad Company tug, by which it was being towed to South Amboy, N. J. In the progress of the trial Sergeant Dunn, the Weather Bureau observer at New York city, testified that he had warned the public, including the Pennsylvania Railroad Company officials, of the approaching storm from Cape Hatteras. The question raised in the case is whether it is a legal duty of those having water craft in their charge to respect Weather Bureau warnings. The decision of the court is awaited with intense curiosity, because it involves, to a certain extent, the value of Weather Bureau warnings. It all indicates that in the near future marine insurance may contain, in every policy, a proviso by which the insurance will become inoperative and void in case of loss by a storm against which the Weather Bureau shall have sent out timely warnings.

BUREAU OF ANIMAL INDUSTRY.

The most effective and valuable work rendered by the Bureau of Animal Industry to the commercial interests of the country during the past fiscal year has been in the inspection of meat for the export and interstate trade. At forty-six (46) abattoirs, situated in seventeen (17) cities, the number of animals inspected has increased from four million eight hundred and eighty-five thousand six hundred and thirty-three (4,885,633) in 1893 to twelve million nine hundred and forty-four thousand and fifty-six (12,944,056) in 1894. The cost of inspection has been reduced from 4¾ cents per head in 1893 to 1¾ cents per head in 1894.

The ante-mortem and post-mortem inspection of animals intended for human consumption will soon be completely under civil-service rules and altogether in the hands of skilled veterinarians. Hereafter no person can be appointed an inspector except he shall have exhibited to the U. S. Civil Service Commission his diploma from a reputable veterinary college, and also have submitted to and passed a satisfactory examination before that honorable body. Thus all export and interstate meat will have been examined, scientifically, by an employé of the U. S. Government, and by him certificated as wholesome and edible. This governmental certification by skilled veterinarians is in fact a guaranty in all European and other markets of the wholesomeness of American meat. Possibly, as a sanitary precaution, it would be well for the United States to demand governmental inspection and chemical analysis of specimens of all wines, brandies, and other beverages which are imported

from Europe, at the hands of the governments of those countries whence they are exported. If it is wisdom on the part of foreign nations to demand inspection and certification (for sanitary reasons) by the American Government of its exports to them, and wise for us to comply with that demand, would it not be equally wise (upon sanitary grounds) for the United States to require governmental inspection and certification of all foreign nations for exports into the United States intended for the consumption of its citizens?

The amount of pork microscopically examined for export during the year was thirty-five million four hundred and thirty-seven thousand nine hundred and thirty-seven (35,437,937) pounds. But in the year 1893 it was only twenty million six hundred and seventy-seven thousand four hundred and ten (20,677,410) pounds. In 1894, one million three hundred and seventy-two thousand four hundred and ten (1,372,410) pieces, from as many different carcasses, have been microscopically examined under the direction of this Bureau.

The cost of microscopic inspection has been diminished during the year 1894 from 8¾ cents per carcass or piece, in 1893, to 6½ cents per capita. This indicates a reduction of nearly 25 per cent. The cost of inspecting microscopically the pork sold in Germany and France (no other European countries demand such inspection) by the United States, in the year 1893, was one hundred and seventy-two thousand three hundred and sixty-seven dollars and eight cents ($172,367.08). But during the year 1894 the quantity so inspected was increased fifteen millions (15,000,000) of pounds, and the cost of inspection was in the same twelve months reduced to eighty-eight thousand nine hundred and twenty-two dollars and ten cents ($88,922.10).

During the last half of the fiscal year the United States exported twenty-two million eight hundred and nineteen thousand two hundred and thirty-one (22,819,231) pounds, and the cost of inspection was thirty-six thousand four hundred and eighty-eight dollars and forty-two cents ($36,488.42).

The Secretary of Agriculture recommends that the law providing for the inspection of export and interstate meat be so amended as to compel the owners of the meat inspected to pay the cost of the microscopic inspection. If governmental inspection and certification widens the foreign and interstate markets for the products of any slaughtering and packing establishment, it, by having increased the demand for those products, has enhanced their prices. It is only equitable that those pay for the inspection who are directly pecuniarily benefited thereby.

As long as the Government pays for microscopic meat inspection, many establishments will demand inspection which have neither interstate nor export trade. If the inspection is worth anything at all to killers, packers, and dealers in fresh or cured meats, they should pay for it. As the law exists to-day, any slaughtering establishment, no matter how insignificant, which declares it has or expects to have for-

eign trade in meats, has a legal right to demand Governmental inspection and certification. It costs individuals nothing. When the killers, packers, and dealers demanding the inspection are compelled, by law, to pay the cost thereof, only that inspection will be called for which is necessary for the facilitation of foreign trade. No inspection will be asked merely to give employment to microscopists and others, at the expense of the Treasury of the United States. It is temptingly easy to be benevolent and generous at public cost.

The live beef cattle exported and tagged during the year numbered three hundred and sixty-three thousand five hundred and thirty-five (363,535). This is an increase of sixty-nine thousand five hundred and thirty-three (69,533) head, or more than 25 per cent, as compared with the previous year.

In the same time the employés of the Bureau of Animal Industry inspected, also for export, eighty-five thousand eight hundred and nine (85,809) head of sheep.

After the experience of supervising the transportation of export animals for some years, many modifications of the accommodations and conditions for their proper care have been insisted upon and adopted. By these innovations and ameliorations the losses in shipping live cattle have been very much reduced. In 1891 those losses were 1.6 per cent, in 1892 they were 0.75 per cent, in 1893, 0.47 per cent, and in 1894 0.37 per cent; sheep lost in transportation during the present fiscal year, 1.29 per cent. This latter rate of loss indicates that further modifications of the regulations regarding the shipment of sheep are desirable.

Stock yards inspection is maintained for the purpose of tagging export cattle, and for supervising their shipment to the seaboard and certifying their healthfulness at the time they leave American ports. It is further intended to prevent the dissemination of Texas fever. Southern cattle inspection is reported by the calendar year instead of the fiscal year, in order to include an entire quarantine season, which extends from February 15 to December 1. During 1893 there were inspected and placed in the quarantine pens in various stock yards one million seven hundred and thirty-seven thousand three hundred and eighty (1,737,380) head of cattle. During the same period of time inspectors supervised the cleaning and disinfection of fifty-six thousand four hundred and six (56,406) cars. In Great Britain the inspection of animals received from the United States has been continued for the purpose of learning the condition in which they reach British ports and the amount of losses suffered at sea from diseases with which animals in transit are often affected, and also for the purpose of ascertaining the adequacy of the sanitary regulations and fittings of the vessels engaged in animal transportation.

This thorough inspection, it has been hoped, would result in the revocation of the British restrictions upon the American cattle trade, by

demonstrating that there is no danger, through animals of the United States, of the introduction of contagious diseases into the United Kingdom. More than two years have passed without the development of any pleuro-pneumonia or other diseases in the United States which might be, through our export cattle, made dangerous to the stock interests of Great Britain. But the hoped-for revocation of British restrictions remains unrealized.

The expense of sanitary inspection of cattle shipped to Europe has averaged 10¾ cents for each one exported. The cost of inspecting Southern cattle and supervising the disinfection of cars and stock yards averages 2.7 cents per animal.

During the year there were quarantined eight hundred and six (806) head of imported animals. In the same time there were imported from Canada and inspected one hundred and ninety-four (194) head of cattle, two hundred and forty thousand four hundred and twenty-seven (240,427) sheep, thirteen hundred and two (1,302) hogs, and two (2) goats.

The scientific inquiries of the Bureau of Animal Industry have progressed steadily during the year, and much tuberculin and mallein have been furnished to State authorities for use in the ascertainment and treatment of tuberculosis and glanders.

The appropriation to the Bureau of Animal Industry for the year ending June 30, 1894, was eight hundred and fifty thousand dollars ($850,000). The expenditures during the year out of that appropriation aggregate only four hundred and ninety-five thousand four hundred and twenty-nine dollars and twenty-four cents ($495,429.24). This leaves an unexpended balance of three hundred and fifty-four thousand five hundred and seventy dollars and seventy-six cents ($354,570.76).

In the appropriation bill for the current year (1894–'95), tuberculosis and sheep scab are specifically mentioned among those diseases which the Secretary of Agriculture is authorized to guard against in such manner as he may think best. Endeavoring to carry out the suggestive provisions of the act above cited, the Department has avoided expending public funds for such purposes as private owners or the respective States ought reasonably to provide for. It is believed to be the duty of the Bureau of Animal Industry to seek, in every possible way, scientific enlightenment, to be disseminated among the agriculturists of the country, so as to lead up to the extermination and suppression of the diseases of domestic animals; but it is not believed that the Department of Agriculture is justified in much other than educational work. The several States of the Union can do the necessary police work in the prevention of the spread of diseases of domestic animals within their own bounds. But very much must be left to the enlightened self-interest of the stock-owners themselves.

Quite recently this Department has published the result of its inves-

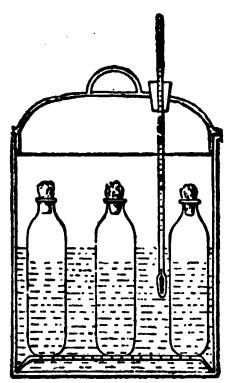
tigations of bovine tuberculosis. These researches will be vigorously continued. Certain herds in the District of Columbia will be thoroughly inspected, and many of the animals which respond to the tuberculin test may be slaughtered, and for them, by the terms of the appropriation act, their owners may be partially remunerated. But there will be only a sufficient number of animals purchased by the Department to intelligently prosecute its scientific work and for purposes of illustration, description, and definition.

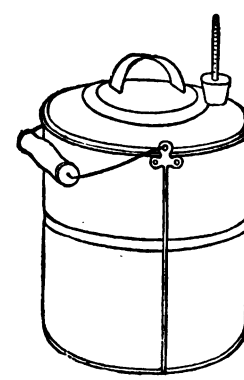
THE STERILIZATION OF MILK.

The sterilization of milk suspected of containing the bacilli of tuberculosis has been very thoroughly explained in a leaflet by Dr. D. E. Salmon, the chief of the Bureau. This leaflet was issued July 24, 1894, and given general circulation throughout the country. Pending the investigation of tuberculosis, and in view of the jeopardy to human health and life which some say is constantly evolved therefrom, the sterilization of milk may be made a shield and safeguard in every household.

The leaflet above referred to is as follows:

The sterilization of milk for children, now quite extensively practiced in order to destroy the injurious germs which it may contain, can be satisfactorily accomplished with very simple apparatus. The vessel containing the milk, which may be the bottle from which it is to be used, or any other suitable vessel, is placed inside of a larger vessel of metal, which contains the water. If a bottle, it is plugged with absorbent cotton, if this is at hand, or in its absence other clean cotton will answer.





A small fruit jar, loosely covered, may be used instead of a bottle. The requirements are simply that the interior vessel shall be raised about half an inch above the bottom of the other, and that the water shall reach nearly or quite as high as the milk. The apparatus is then heated on a range or stove until the water reaches a temperature of 155° F., when it is removed from the heat and kept tightly covered for half an hour. The milk bottles are then taken out and kept in a cool place. The milk may be used any time within twenty-four hours. A temperature of 150° maintained for half an hour is sufficient to destroy any germs likely to be present in the milk, and it is found in practice that raising the temperature to 155° and then allowing it to stand in the heated water for half an hour insures the proper temperature for the required time. The temperature should not be raised above 155°, otherwise the taste and quality of the milk will be impaired.

The simplest plan is to take a tin pail and invert a perforated tin pie plate in the bottom, or have made for it a removable false bottom perforated with holes and having legs half an inch high, to allow circulation of the water. The milk bottle is set on this false bottom, and sufficient water is put into the pail to reach the level of the surface of the milk in the bottle. A hole may be punched in the cover of the pail, a cork inserted, and a chemical thermometer put through the cork, so that the bulb dips into the water. The temperature can thus be watched without removing the cover. If preferred an ordinary dairy thermometer may be used and the temperature tested from time to time by removing the lid. This is very easily arranged, and is just as satisfactory as the patented apparatus sold for the same purpose. The accompanying illustration shows the form of apparatus described.

Inasmuch as the milk furnished to consumers in larger cities in summer contains at the time of delivery an immense number of miscellaneous bacteria, the above procedure does not fully meet the requirements during hot weather, not only because such milk will not remain fluid for twenty-four hours unless kept in a good refrigerator, but because the bacteria not destroyed by the heating may at times produce digestive disturbances in the very young. Under the circumstances it is best to keep the bottles in the water until it boils or to use one of the many steamers now in the market. After the bottles have been kept at the boiling point for three to five minutes they should be cooled as promptly as possible and kept in a refrigerator until used. If it is known that the milk reaches the consumer soon after milking, it is safe to adopt the procedure first recommended and to raise the temperature to 165° before removing the pail from the fire. In cold weather the process as recommended in the first edition is entirely satisfactory.

Before using the dairy thermometer it is best to have it tested, as it may be unreliable in the upper parts of the scale.

OFFICE OF EXPERIMENT STATIONS.

The Office of Experiment Stations, which is a part of the U. S. Department of Agriculture, has during the past year engaged itself almost wholly in preparing for publication works based upon the reports of Agricultural Experiment Stations and other institutions for agricultural inquiry in the United States and foreign countries. Bulletins, reports, and other publications from such stations have multiplied so rapidly that it is absolutely necessary to brief them in order to give them general circulation. Therefore, in order to reach the American farmers, the aforesaid bulletins and reports have been abstracted, sifted, compiled, and published in convenient form. Twenty-four (24) documents, making over two thousand (2,000) pages, have been issued. Among them is the fifth volume of the Experiment Station Record. It contains abstracts of three hundred and ten (310) reports of American stations, sixty-seven (67) bulletins of this Department, and two hundred and twenty-seven (227) reports of foreign stations and other institutions.

The "Handbook of experiment station work" is a digest of the published work of the American experiment stations during the past twenty years. There has also been prepared a number of farmers' bulletins, based chiefly upon the work of experiment stations. There is now in process of publication a handbook on the culture and uses of the cotton plant. This will present a scientific and condensed state-

ment of practical knowledge. It will tend to improve the varieties of the cotton plant and advance the methods of culture and stimulate the production and use of cotton-seed products.

During the year seeds of new and rare varieties of foreign plants and vegetables have been distributed to forty (40) experiment stations and to about three thousand (3,000) farmers selected by those stations for the purpose of making full tests.

The Secretary of Agriculture in his report for 1893 called attention to the fact that the appropriations made for the support of the experiment stations throughout the Union were the only moneys taken out of the National Treasury by act of Congress for which no accounting to Federal authorities was required. The Fifty-third Congress, heeding the suggestion, in making the appropriation for the Department for the present fiscal year provided that—

> The Secretary of Agriculture shall prescribe the form of annual financial statement required by section 3 of said act of March 2, 1887; shall ascertain whether the expenditures under the appropriation hereby made are in accordance with the provisions of said act, and shall make report thereon to Congress.

That the stations might have the earliest advice as to the intentions of the U. S. Department of Agriculture with regard to their expenditures, schedules for the financial reports of the experiment stations were prepared and issued to them immediately after the appropriation bill had passed. This new provision of law, construed with the previous legislation on the subject, gives the Secretary of Agriculture ample authority to investigate the character and report upon the expenditures of all these stations. Obeying this law, the Department of Agriculture proposes to make, through its expert agents, systematic examinations of the several stations during each year, for the purpose of acquiring, by personal presence, detailed information necessary to enable the Secretary of Agriculture to make an exhaustive and comprehensively satisfactory report to Congress. It is due to the boards of management of the several stations to state that, with great cordiality, they have, almost unanimously, approved the amendment to the law which provides for this supervision of their expendtures. Many of them declare that it will increase the efficiency of the stations and protect good men from loose charges of the misuse of public funds; and, furthermore, that it will bring the U. S. Department of Agriculture into closer and more confidential relations with the experiment stations, and that acting together thus harmoniously and intelligently, the efficiency of their service to the agriculture of the Union will be vastly advanced.

NUTRITION.

Acting upon the recommendations contained in the report of 1893, Congress appropriated ten thousand dollars ($10,000) "to enable the Secretary of Agriculture to investigate and report upon the nutritive

value of the various articles and commodities used for human food, with special suggestion of full, wholesome, and edible rations, less wasteful and more economical than those in common use."

Out of this appropriation money will be used to make analyses of food materials not heretofore analyzed, and for the investigation of the dietaries of the different classes of people in different portions of the country. The relation of food supply and consumption will be elucidated. Inquiries as to the best means of improving the methods of investigations along these lines will likewise be diligently made. A large amount of preliminary work has been accomplished during the year, the results of investigations thus far made in this country and elsewhere have been correlated, and a bulletin containing a résumé of these matters is already in press.

The health of all depends largely upon the adaptability of the food consumed. The capacity for work in each human being rests upon the same foundation. But the most intelligent know very little as to the real composition of their daily food. The kinds or amounts of nutritive material contained in it and its value are generally matters of guess-work, if thought of at all. The cost of this ignorance is loss of health and waste of money. Unfortunately it is the poor who suffer most from the unwise purchase and improper use of food. It is too often true that the poor man's money is the worst spent in the market, and too often true that the poor man's food is the worst cooked and served at home. In this matter of nutrition is a verification of the Scriptural passage: "To him that hath shall be given, and from him that hath not shall be taken even that which he hath."

From the hygienic standpoint also the demand for increased knowledge of this kind is imperative. A large part of the diseases formerly attributed to old age is due, in greater or less degree, to errors in diet.

Earnest and intelligent investigation of food and the relative nutritive value of various kinds is needed, and the facts found in these researches should be widely scattered among the people of the United States. And it must not be forgotten that here, as elsewhere, the knowledge which has the most immediate, practical value must be based upon research of the highest scientific order.

Coöperation by the agricultural colleges and experiment stations will be sought in these investigations. To Mr. Edward Atkinson, economist and publicist, of Boston, Mass., and to the distinguished physiological chemist, Prof. W. O. Atwater, of the Wesleyan University at Middletown, Conn., the Department and the American people are very much indebted, because of their earnest, intelligent researches in, and unselfish devotion to, the science of nutrients and nutrition.

If such investigations are considered by such men worthy of their diligent and untiring pursuit, how much more ought the same subjects to be of interest to the teachers and pupils of the schools of this Republic? As civilization advances, the time approaches when the proper use

of nutrients and the correct nutrition of the human body will be regarded as indispensable to the proper education of every American boy or girl.

A farmers' bulletin, containing an elementary discussion of the nutritive value and pecuniary economy of foods is now nearly ready for distribution. Fully one-half of all the money earned by the wage-earners of the civilized world is expended by them for food. In this paper the first lessons are given in the proper selection and economy in the use of food materials. But an economy of food is not the only thing desirable. More important than this is the question of cooking food in such manner as will, in the greatest degree, promote the public health.

The following extract from the farmers' bulletin on foods, above referred to, was given to the newspapers of the United States some weeks since. It contributed to a discussion of the discrepancy between the price of flour *to* the baker and the price of bread *from* the baker, which has made better loaves and more nutriment for less money in many cities throughout the country. All eat bread. They have been benefited. Relatively few make bread, and they have not been unjustly treated:

THE COST OF BREAD.

The chief difference in the composition of flour and bread is the proportions of water, which makes about one-eighth the weight of flour and one-third that of the bread. The average composition of wheat flour and the bakers' bread made from it is about as follows:

Comparison of flour and bread.

	Water.	Nutrients.					Fuel value of one pound.
		Total.	Protein.	Fats.	Carbohydrates.	Mineral matters.	
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories.*
Wheat flour	12	88	11	1	75	1	2,000
Bakers' bread	32	68	9	2	56	1	1,300

In making the bread a little butter or lard, salt, and yeast, and considerable water, either by itself or in milk, are added to the flour. The yeast causes carbohydrates (sugar, etc.) to ferment, yielding alcohol and carbonic acid in the form of gas, which makes the dough porous. In the baking the alcohol is changed to vapor and the carbonic acid is expanded, making the bread still more porous, and both are mostly driven off. Part of the water escapes with them. The amount of sugar and other carbohydrates lost by the fermentation is not very large, generally from 1½ to 2 per cent of the weight of the flour used. With the increase in the proportion of water in the bread as compared with the flour the proportion of nutrients is diminished, but the addition of shortening and salts brings up the fat and minerals in the bread so that the proportions are larger than in the flour.

In practice 100 pounds of flour will make from 133 to 137 pounds of bread, an average being about 136 pounds.

Flour, such as is used by bakers, is now purchased in the Eastern States at not over $4 per barrel. This would make the cost of the flour in a pound of bread about 1½

cents. Allowing one-half cent for the shortening and salt, which is certainly very liberal, the materials for a pound of bread would cost not more than 2 cents. Of course there should be added to this the cost of labor, rent, interest on investment, expense of selling, etc., to make the actual cost to the baker.

Very few accurate weighings and analyses of bakers' bread have been made in this country, so far as I am aware, but the above statements represent the facts as nearly as I have been able to obtain them.

The average weight of a number of specimens of 10-cent loaves purchased in Middletown, Conn., was one and one-fourth pounds. This makes the price to the consumer 8 cents per pound. The price of bread and the size of the loaf are practically the same now as when the flour cost twice as much.

The cost of bakers' bread is a comparatively small matter to the person who only buys a loaf now and then, but in the Eastern States and in the larger towns throughout the country many people, and especially those with moderate incomes and the poor, buy their bread of the baker. Six cents a pound or even half that amount for the manufacture and distribution seems a very large amount.

In the large cities competition has made bread much cheaper, but even there the difference between the cost of bread to the well-to-do family who bake it themselves and to the family of the poor man who buy it of the baker is unfortunately large.

DIVISION OF ENTOMOLOGY.

On April 26, 1894, Prof. C. V. Riley, for many years the chief of the Division of Entomology of the U. S. Department of Agriculture, submitted his resignation. That communication states: "This action, which I have for some time contemplated, is taken without suggestion from or consultation with you (the Secretary of Agriculture) or anyone else, but purely for the reasons mentioned." Among those reasons is stated "a due regard for the wishes of family and for health."

The services of Prof. Riley to American entomology, extending over nearly a generation, are fully known and justly appreciated in the United States and in foreign lands. His resignation for the reasons which he cogently stated compelled its own acceptance and released him from arduous and taxing duties. Mr. L. O. Howard, who had during nearly the entire incumbency of Prof. Riley been the assistant entomologist, and who had already earned a reputation as a scientific man and an economic entomologist, was promoted immediately to the position of chief of the division, and then, by order of the President of the United States, the division was classified into the civil service, so as to include both the chief and assistant chief.

In the year 1894 diligent attention has been paid to ascertaining the exact localities in the several Eastern States where the San Jose or pernicious scale of California is alleged to have made its appearance. The method of the dissemination of this pest has been found, and the nurserymen concerned in its spread have been induced to make strenuous efforts for its destruction.

Insects injurious to stored grains have also been under continuous investigation, and a full report thereupon, with results of remedial experimentation, will soon be given to the public.

Investigations of the chinch bug have been extended in certain Western States, in coöperation with the Department, and facts of practical value, bearing upon the relations of agricultural methods and climate to the propagation of the chinch bug, have been ascertained.

The insect enemies of the orange and other citrus fruits have been diligently studied, and much valuable material collected for an additional report upon this subject. In harmony with the provisions of the appropriation bill, cotton insects have been the subject of much research. Inquiries were made in the States of Texas, Louisiana, Mississippi, and Alabama, where results of practical value have been reached.

A new and very active enemy of the cotton crop has been discovered recently in Texas, where it was introduced from Mexico. It is in the shape of a weevil, which bores into the bolls. The study of this insect has been begun. A special agent was sent to the agricultural sections of Mexico recently opened up by railways, who has forwarded to the Division of Entomology many interesting specimens and many valuable data which will serve to familiarize the people with other injurious insects which are liable to be imported from Mexico to the United States.

The experimental work against predaceous and destructive insects has been continued, mainly in the line of testing new machinery and in determining the effects of insecticide mixtures upon the foliage of plants at different seasons, and in determining the usefulness of these insecticides against the new peach scale and the San Jose or pernicious scale of fruit trees above referred to. The publication of a series of leaflets or circulars upon insects especially dangerous to horticulture has been commenced. A manual of bee culture is completed, and one bulletin has been contributed to the series of the division and another to the series of the farmers' bulletins.

DIVISION OF VEGETABLE PATHOLOGY.

The diligent study of the diseases of cereal crops and fruits has been continued by this division during the entire year. Recognizing the vast value of the cereal crops produced in this country, and the immense losses accruing to them because of the attacks of certain diseases, particularly rusts and smuts, an expert investigator was appointed early in the year to take charge of this particular line of inquiry.

In the laboratory of the division at Washington, pear blight, diseases affecting the melons of the South, diseases of cereals, and diseases of fruits of the Pacific coast and of Florida, have been investigated. It has been ascertained that a simple and inexpensive treatment used early in the spring will almost completely hold in check a disease of the leaves of the peach tree which has recently damaged fruit-growers many thousands of dollars. The remedy has been tested among

the peach orchards of California and the eastern portion of the United States and has proven highly efficacious. Several other diseases of plants and fruit trees are now under investigation with excellent probabilities of discovering a successful remedy. A branch station of this division in Florida is particularly devoting itself to the study of the diseases of citrus fruits and other subtropical plants.

DIVISION OF ORNITHOLOGY AND MAMMALOGY.

The work of this division divides itself into two attractive subjects. The first is the geographic distribution of animals, and the second the study of injurious and useful birds and mammals. Under the first head enough data have now been collected to finally solve the problem of temperature control of the geographic distribution in North America of animals and plants. Their laws of distribution have been formulated, and the result of the investigation will be published in a few months. The study of life zones has extended over large areas in the West. The field work has covered twenty-five (25) States and Territories west of the Mississippi River, and also embraced Pennsylvania and three of the Southern States.

Two groups of mammals very injurious to agriculture, the California jack rabbit and the pocket gopher of the plains and the Mississippi Valley, have received attention during the year. An exhaustive study has been made of the pocket gopher, the results of which will appear in a popular bulletin on his food habits, his injury to crops, and the methods of extermination.

During the inquiry into the food of birds and mammals, three thousand four hundred and twenty (3,420) stomachs of birds were added to the collection, and fourteen hundred and forty (1,440) of them were carefully examined. The stomachs of many mammals were dissected in the laboratory and in the field. A report on the food habits of the kingbird, with special reference to its habits relating to agriculture and horticulture, has been prepared. There has also been completed a leaflet on the food habits of the woodpecker, and a similar one on the food habits of blackbirds.

Some species of beautifully plumaged and useful birds are being exterminated in the United States to satisfy the barbaric demand for ornithological ornamentation of feminine head wear. By educating the public mind to a better understanding of birds, their interesting habits and uses to man, this division is doing much to prevent this and other similarly cruel and senseless practices which, if not arrested, will result in the total destruction of many of our most beautiful and useful American birds.

The eminent scientist at the head of this division, Dr. C. Hart Merriam, and his capable assistant, have been, by order of the President, placed in the classified service.

DIVISION OF BOTANY.

During 1894 a great amount of agitation and some trepidation has existed in certain Northwestern States relative to the Russian thistle and its possible detrimental and universal dissemination throughout the Northwest. The Division of Botany, therefore, made a special effort to systematically collect information as to this newly arrived emigrant weed and to provide methods for its speedy repressment and eradication. One result of this inquiry is that the seeds of new grasses and forage plants from abroad will be hereafter, for the public protection, very carefully inspected as to their freedom from weed seeds. If possible, it might be well to require certification as to freedom from weed seeds and absolute purity and vitality of all seeds imported into the United States. A laboratory has been equipped and a special assistant detailed to give his entire time to the study of seeds with regard to their purity, vitality, and improvement.

The census of 1890 shows the value of farms in the United States which are entirely devoted to seed-growing to be over eighteen millions of dollars ($18,000,000). The export of clover seed alone during the year ending June 30, 1894, is estimated at four million five hundred and forty thousand dollars ($4,540,000). The export of American seeds may be vastly increased by exalting the standard of purity and germinating vitality and giving all other peoples the same guaranty that we ask of them. The same course will increase the domestic use of American-grown seed. When information as to its high quality has been diffused, this course will vastly widen the world markets for American seed and so enhance their value by giving increasing demand everywhere.

DIVISION OF FORESTRY.

The greater part of the appropriation for the Division of Forestry has been expended during the present year in investigating the strength of different timber woods and the conditions that influence their quality. The importance of such an inquiry was pointed out in the Report of the Secretary of Agriculture for 1893. Attention was also called to the unqualified commendations which had been bestowed upon this work not only in the United States but in foreign countries. The full value of the investigation will not be apparent until it has been carried to a successful termination, when the accumulated data will be carefully collated, with the intent of discovering the laws which give different degrees of strength to different varieties of timber. A knowledge of such laws will make the everyday use of timber in building much safer and more satisfactory than it has been. The financial and economic value of these timber examinations can hardly be estimated at the present moment.

The practice of "boxing" pine trees for turpentine, it has been discovered, does not decrease the strength of the lumber. This discovery

alone, it is stated, will add two millions of dollars to the value of the pineries of the Southern States, which are being "bled" for turpentine. It is further established that the longleaf pine of the South is generally far stronger than heretofore admitted, and, therefore, for structures like bridges, trestles, and rooftrees made of this timber, it is practicable to effect a saving of 25 per cent of material without reducing the factor of safety. This saving applies to about two million M. feet of longleaf pine timber annually used for such purposes, and the present money value of that saving of longleaf pine lumber can be calculated at six millions of dollars ($6,000,000). These facts may render possible the extension of the time in which our forest supplies of this most valuable timber must be exhausted. This line of work, which establishes the true value of our varieties of timber, should be pushed to a conclusion as rapidly as possible. Therefore it has been recommended that Senate bill No. 313, making a special appropriation of forty thousand dollars ($40,000) for the completion of this work, be passed whenever the people seem to demand it and the condtion of the public Treasury may permit such an expenditure.

Inquiry into the rate of growth and production of the most valuable lumber trees is needed in order to properly estimate the profit that may be derived from forest management. Only the white pine and the black spruce have so far been partly examined. But the information obtained is so valuable that it makes more apparent than ever the necessity of similar investigations upon other timber trees. Inquiries have been made, and are in progress, as to the principles and effectiveness of dry kilns for lumber, and also as to the increase in the use of metal for railroad ties and other processes of economy in the use of wood for railroad construction.

Popular instruction as to the disastrous results upon adjacent agricultural valleys of the denudation of hills and mountains, should be given in every schoolhouse in the Union. Prof. Rothrock, of Pennsylvania, and Dr. Fernow, the chief of the Division of Forestry of the U. S. Department of Agriculture, have shown themselves efficient teachers and workers in this regard. The deforestation of the American Continent will practically be an accomplished fact within another century unless systematic and intelligent reafforestation be speedily inaugurated.

DIVISION OF CHEMISTRY.

The Division of Chemistry, in harmony with the provisions of the appropriation act, has during the past year devoted itself to the investigation of the adulteration of foods, drugs, and liquors, and to the prosecution of experiments in sugar production. Examinations for the usual adulterations have been made of large numbers of specimens of meals, flours, and breads; but in no instance has there been found an adulteration of American flour with terra alba or any other material. It

is gratifying to know withal, that while this sort of adulteration is practiced largely in foreign countries, it has not obtained foothold in the United States. The only deceptions in the flour trade have been found in the substitution of cheaper grades for dearer ones. In bread the chief adulterant found has been alum. That substance is added for the purpose of whitening the loaf.

Wines have been examined very thoroughly; especially have adulterants been sought for in the coloring matter used. It is impossible to tell by chemical analysis whether any given amount of alcohol found in wines is natural or artificial. The Division of Chemistry has ascertained that the pure wines of the United States and the pure wines produced in Europe are not very dissimilar in many cases. Where there are differences, they have been carefully determined and defined.

The chemical examinations of the typical soils of the United States have been commenced, and a series of pot experiments have been begun, having for their object the practical test of the several methods of analysis heretofore adopted and the actual powers of plants to assimilate different kinds of food in the soil. It is sought in this way to learn approximately the available plant food in each type of soil. In conjunction with this, a thorough study of the nitrifying organisms of the soils has also been commenced. In addition to the above work, numerous inquiries as to the methods of analysis have been carried out, and a great number of miscellaneous samples have been analyzed.

DIVISION OF POMOLOGY.

During the year Mr. S. B. Heiges, of Pennsylvania, a horticulturist of long experience and of practical skill, was made chief of the division, and it is to-day in better working order than ever before since its creation. By order of the President it has been placed wholly in the classified civil service, from the chief and assistant chief down to the messengers.

The division is principally engaged in correspondence with fruit-growers; in critical examination and comparison of specimen fruits received from them for identification, description, and illustration of such specimens as may seem worthy of record and propagation. All new and improved varieties of this sort are modeled and colored.

During the year close attention has been given to the investigation of the varieties of the apple. Notwithstanding the almost total failure of the crop, some two hundred (200) specimens of new or little-known varieties of apples—some of which promise to be very valuable—have been received. Beside these many old varieties which had been catalogued and planted as new have been identified as to their origin and character.

The damaging frosts of the last week in March were made the subject of investigation during the month of April, and the results were published in a special circular with the report of the Statistician for May. Important facts were developed in the course of this inquest which will

be of great value to peach-growers. Noticeable among them is the fact that certain groups or families of the Persian race of peaches bloom later than others in the South, and they are therefore less likely to have their fruit cut off by frosts. This discovery is of great value, and estimated to be worth, in dollars and cents, many times the expense of the investigation. Numerous scions and plants of promising varieties have been experimentally planted during the year.

Among the principal importations by the Division of Pomology are collections of fig cuttings from England and citron cuttings from Corsica.

DIVISION OF ACCOUNTS.

Congress appropriated to the U. S. Department of Agriculture for the year ending June 30, 1894, exclusive of the appropriation of seven hundred and twenty thousand dollars ($720,000) for agricultural experiment stations, $2,603,500. Of this amount one million seven hundred and ninety thousand five hundred and thirty dollars and seventy cents ($1,790,530.70) were disbursed prior to July 1, 1894. In addition to this sum there remained at that date unpaid bills aggregating $200,000. The payment of these will make the total expenditures for the fiscal year 1894 $1,990,530.70. In other words, when the accounts of the Department of Agriculture for the fiscal year ending June 30, 1894, shall have been finally adjusted there will be covered back $600,000 into the U. S. Treasury, or about 23 per cent of the entire appropriation.

For the last fiscal year 31 specific appropriations were made, and also 15 subappropriations which required separate and distinct accounts.

During the year 11,863 accounts were received, audited, and paid. They included the supplemental accounts of 1893, which amounted to $1,967,842.79. Ninety-three requisitions were drawn on the United States Treasury in liquidation of those accounts, aggregating $2,014,809.95. Those requisitions were in settlement of 19,100 checks, exclusive of about $450,000 paid in currency over the counter.

During the year 59 separate amounts were received from various sources from the sale of condemned Government property. That and other similarly derived moneys were deposited in the U. S. Treasury to the credit of "Miscellaneous receipts," as provided by law. They aggregated $7,135.

During the twelve months ending June 30, 1894, the expenditures chargeable to the appropriations for that fiscal year were less by $386,364.83 than the expenditures during the twelve months ending June 30, 1893, chargeable to the appropriations for that year—an average monthly reduction of $32,197.07. Attention is called to the statement of the Annual Report of the Department of Agriculture submitted on the 20th of November, 1893, in which the hope is expressed that a saving may be made of 12 per cent, and to the fact that the present report justifies that hope and verifies all that has been claimed as to economy in the present management.

The statements of the several divisions of the Department show that efficiency has not been sacrificed to economy, because in each division it is observable that more and better work has been accomplished during the last twelve months than during any previous twelve months of their existence.

The total appropriations for 1894–'95 are less by $104,476.94 than those for the year 1893–'94. And this decrease occurs, notwithstanding a new appropriation of $10,000 for nutrition, and the fact that the seed fund included $30,000 for farmers' bulletins. The estimates for 1896 are less by $98,693.06 than the appropriation for the current year.

The expenses of the Department of Agriculture from July 1 to October 31, 1894, were less by $9,418.76 than during the parallel period of last year; and by $78,852.41 than during the period from July 1 to October 31, 1892, thus realizing the hope expressed in the report of the Secretary for 1893 that the reduction then referred to would be made permanent.

There were upon the pay-rolls of the Department, in the city of Washington, on March 1, 1893, 750 persons, with salaries aggregating $54,764.82 per month.

On March 1, 1894, the rolls showed 622 names, with salaries amounting to $49,085.66 per month.

On November 1, 1894, there were 559 employés, with salaries aggregating $45,557.74 per month; a reduction of 191 in the number of employés between March 1, 1893, and November 1, 1894, and a saving in the amount of salaries of $9,207.08 per month.

Comparative statement, showing amount of appropriations for the Department of Agriculture for the fiscal year ending June 30, 1895, and amount of estimates submitted by the Secretary of Agriculture for the fiscal ending June 30, 1896.

	Appropriation 1895.	Estimate for 1896.	Increase.	Decrease.
Office of the Secretary	$91,140.00	$94,140.00	$3,000.00	.....
Division of Accounts and Disbursements	17,300.00	17,500.00	200.00	.....
Division of Statistics	145,360.00	145,160.00	.....	$200.00
Division of Botany	38,600.00	33,800.00	.....	4,800.00
Division of Entomology	29,800.00	29,500.00	.....	300.00
Division of Ornithology and Mammalogy	27,360.00	27,560.00	200.00	.....
Division of Pomology	11,300.00	12,500.00	1,200.00	.....
Division of Microscopy	7,300.00	7,300.00	.....	.....
Division of Vegetable Physiology and Pathology	26,100.00	26,500.00	400.00	.....
Division of Chemistry	32,000.00	32,000.00	.....	.....
Division of Forestry	28,320.00	33,520.00	5,200.00	.....
Division of Publications (Records and Editing)	8,100.00	8,300.00	200.00	.....
Division of Illustrations	15,000.00	15,000.00	.....	.....
Farmers' Bulletins (Division of Seeds)	177,520.00	56,000.00	.....	121,520.00
Document and Folding Room	5,600.00	9,040.00	3,440.00	.....
Museum	5,400.00	5,400.00	.....	.....
Library	6,000.00	6,000 00	.....	.....
Agricultural Experiment Stations	745,000.00	750,000.00	5,000.00	.....
Experimental gardens and grounds	32,000.00	28,500.00	.....	3,500.00
Furniture, cases, and repairs	10,000.00	10,000.00	.....	.....

Comparative statement, showing amount of appropriations, etc.—Continued.

	Appropriation 1895.	Estimate for 1896.	Increase.	Decrease.
Postage	$5,000.00	$2,000.00	.....	$3,000.00
Contingent expenses	25,000.00	25,000.00	.....	.....
Investigations with relation to agricultural soils	.....	15,000.00	$15,000.00	.....
Inquiries relating to public roads	10,000.00	10,000.00	.....	.....
Experiments in the manufacture of sugar	10,000.00	10,000.00	.....	.....
Irrigation investigations	6,000.00	8,000.00	2,000.00	.....
Nutrition investigations	10,000.00	15,000.00	5,000.00	.....
Investigations, etc., with grasses and forage plants	.....	15,000.00	15,000.00	.....
Fiber investigations	5,000.00	.....	.....	5,000.00
Bureau of Animal Industry	800,000.00	800,000.00	.....	.....
Quarantine stations	12,000.00	12,000.00	.....	.....
Weather Bureau	876,823.06	860,610.00	.....	16,213.06
Total	3,219,023.06	3,120,330.00	55,840.00	154,533.06
Net decrease	.....	.....	.....	98,693.06

NOTE.—The amount appropriated for the office of the Secretary for the fiscal year 1895, as itemized in the bill passed August 8, 1894, was $94,140; but, by an error in printing, was stated as $91,140.

NOTE.—The amount appropriated for seeds for the fiscal year 1895 was divided as follows: Purchase of seeds, $130,000; farmers' bulletins, $30,000; salaries, $12,120; printing, $5,400.

NOTE.—The amount appropriated for agricultural experiment stations for the fiscal year 1895 includes $720,000 for State experiment stations, over which the Department of Agriculture has no control. This statement also applies to the amount estimated for the fiscal year 1896.

The Department of Agriculture expended for the fiscal year 1892, $2,271,312.72; and out of that sum the total amount expended in scientific research was 46.2 per cent. For the fiscal year 1893 the expenditures were $2,354,809.56, and out of it only 45.6 per cent were expended in the application of science to agriculture. But for the year ending June 30, 1894, out of a total expenditure of $1,990,530.70 (estimated), the Department applied 51.8 to scientific work and investigation.

It is, therefore, very plainly observable that the economies which have been practiced in the administration of the Department have not impaired its capacity for scientific research. Comparing the expenditures for the fiscal years 1893 and 1894, respectively, it is noticeable that the total expenditures for 1894 are $364,278.86 less than the total for 1893. But the per cent of the total amount paid out for scientific work, as distinguished from the administration and general business, is 5.6 per cent more, in proportion to the total expenditures during the year 1894, than it was in 1892, and 6.2 more than it was in 1893. And yet during the year, as has been already shown, the new Division of Agricultural Soils has been established and the new Section of Agrostology erected in the Division of Botany.

It has been deemed desirable to reproduce here a full statement of the expenses of this Department for a period of fifteen years from 1878 to 1892, inclusive, showing the objects of the several appropriations and the amount appropriated to each branch of the work. This statement presents in a condensed and practical manner a full history of the development of the Department.

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
		Vol.	Page.	Sec.					
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	Mar. 3, 1877	19	317	1	1878	$65, 640. 00	$65, 640. 00	.....	$65, 640. 00
Collecting agricultural statistics: For collecting and compiling agricultural statistics	....do	19	317	1	1878	15, 000. 00	15, 000. 00	.....	15, 000. 00
Purchase, propagation, and distribution of seeds, trees, shrubs, vines, cuttings, and plants	....do	19	317	1	1878	75, 000. 00	74, 579. 33	$420. 67	75, 000. 00
Experimental garden and grounds: Labor and incidental expenses	....do	19	317	1	1878	4, 000. 00	4, 000. 00	.....	4, 000. 00
Museum: For collecting and modeling specimens of fruits, etc	....do	19	317	1	1878	1, 500. 00	1, 500. 00	.....	1, 500. 00
Furniture, cases, and repairs	....do	19	317	1	1878	4, 500. 00	4, 500. 00	.....	4, 500. 00
Library: For agricultural works of reference, etc	....do	19	317	1	1878	1, 000. 00	1, 000. 00	.....	1, 000. 00
Laboratory: For chemicals, apparatus, etc	....do	19	317	1	1878	1, 000. 00	1, 000. 00	.....	1, 000. 00
Contingent expenses: For incidental expenditures	....do	19	317	1	1878	8, 000. 00	8, 000. 00	.....	8, 000. 00
Postage	....do	19	317	1	1878	4, 000. 00	3, 415. 61	584. 39	3, 415. 61
Improvement of grounds: For labor, etc	....do	19	360	1	1878	6, 500. 00	6, 500. 00	.....	6, 500. 00
Report on Forestry	....do	19	360	1	1878	2, 500. 00	2, 500. 00	.....	2, 500. 00
International Industrial Exposition at Paris	Dec. 15, 1877	20	246	4	1878	10, 000. 00	10, 000. 00	.....	10, 000. 00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	June 19, 1878	20	203	1	1879	66, 900. 00	66, 900. 00	.....	66, 900. 00
Collecting agricultural statistics: For collecting and compiling agricultural statistics	....do	20	203	1	1879	10, 000. 00	10, 000. 00	.....	10, 000. 00
Purchase, propagation, and distribution of seeds, trees, shrubs, vines, cuttings, and plants	....do	20	203	1	1879	75, 000. 00	75, 000. 00	.....	75, 000. 00
Experimental garden and grounds: Labor and incidental expenses	....do	20	203	1	1879	7, 000. 00	7, 000. 00	.....	7, 000. 00
Museum: For collecting and modeling specimens of fruits, etc	....do	20	203	1	1879	1, 000. 00	1, 000. 00	.....	1, 000. 00
Furniture, cases, and repairs	....do	20	204	1	1879	4, 000. 00	4, 000. 00	.....	4, 000. 00
Library: For agricultural works of reference, etc	....do	20	204	1	1879	1, 000. 00	1, 000. 00	.....	1, 000. 00
Laboratory: For chemicals, apparatus, etc	....do	20	204	1	1879	1, 500. 00	1, 500. 00	.....	1, 500. 00
Contingent expenses: For incidental expenditures	....do	20	204	1	1879	8, 000. 00	8, 000. 00	.....	8, 000. 00
Postage	....do	20	204	1	1879	4, 000. 00	3, 960. 00	40. 00	3, 960. 00

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive—Continued.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
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Improvement of grounds: For labor, etc	June 19, 1878	20	240	1	1879	$6,500.00	$6,500.00	.....	$6,500.00
Investigating the history and habits of insects	....do	20	204	1	1879	10,000.00	10,000.00	.....	10,000.00
Investigating diseases of swine and other domestic animals	....do	20	240	1	1879	10,000.00	10,000.00	.....	10,000.00
Erecting stable for tools, etc	Mar. 3, 1879	20	392	1	1879	1,500.00	1,500.00	.....	1,500.00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	June 21, 1879	21	23	1	1880	66,900.00	66,900.00	.....	66,900.00
Collecting agricultural statistics: For collecting and compiling same	....do	21	23	1	1880	10,000.00	9,982.88	$17.12	10,000.00
Purchase, propagation, and distribution of seeds, plants, etc	....do	21	23	1	1880	75,000.00	75,000.00	.....	75,000.00
Experimental garden and grounds: Labor and incidental expenses	....do	21	23	1	1880	6,600.00	6,600.00	.....	6,600.00
Museum: For collecting and modeling specimens of fruits, etc	....do	21	23	1	1880	1,000.00	1,000.00	.....	1,000.00
Furniture, cases, and repairs	....do	21	23	1	1880	4,000.00	4,000.00	.....	4,000.00
Library: For agricultural works of reference, etc	....do	21	23	1	1880	1,000.00	1,000.00	.....	1,000.00
Laboratory: For chemicals, apparatus, etc	....do	21	23	1	1880	1,500.00	1,500.00	.....	1,500.00
Contingent expenses: For incidental expenditures	....do	21	23	1	1880	8,000.00	8,000.00	.....	8,000.00
Postage	....do	21	23	1	1880	4,000.00	4,000.00	.....	4,000.00
Improvement of grounds: For labor and miscellaneous expenses	....do	21	23	1	1880	6,500.00	6,500.00	.....	6,500.00
Investigating the history and habits of insects	....do	21	29	1	1880	5,000.00	5,000.00	.....	5,000.00
Investigating the diseases of swine and other domestic animals	....do	21	30	1	1880	10,000.00	8,878.84	1,121.16	8,878.84
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	June 16, 1880	21	292	1	1881	69,200.00	69,185.22	14.78	69,200.00
Purchase, propagation, and distribution of seeds, plants, etc	....do	21	294	1	1881	82,160.31	82,157.48	2.83	82,157.53
Collecting agricultural statistics	....do	21	293	1	1881	10,000.00	9,985.60	14.40	10,000.00
Experimental garden and grounds: For labor and incidental expenses	....do	21	294	1	1881	7,600.00	7,600.00	.....	7,600.00
Museum: For collecting and modeling specimens of fruits, etc	....do	21	294	1	1881	1,000.00	1,000.00	.....	1,000.00
Furniture, cases, and repairs	....do	21	294	1	1881	5,000.00	5,000.00	.....	5,000.00
Library: For agricultural works of reference, etc	....do	21	294	1	1881	1,000.00	1,000.00	.....	1,000.00
Laboratory: For chemicals, apparatus, etc	....do	21	295	1	1881	4,000.00	4,000.00	.....	4,000.00
Contingent expenses: For incidental expenditures	....do	21	295	1	1881	10,000.00	9,769.17	230.83	10,000.00
Postage	....do	21	295	1	1881	4,000.00	3,838.00	162.00	3,838.00

Improvement of grounds: For labor, etc	....do	21	294	1	1881	5,000.00	5,000.00	.....	5,000.00
Report on forestry	....do	21	296	1	1881	5,000.00	3,762.51	1,237.49	4,700.00
Investigating the history and habits of insects	....do	21	294	1	1881	5,000.00	4,997.31	2.69	4,712.91
Investigating diseases of swine and other domestic animals	....do	21	295	1	1881	10,000.00	10,000.00	.....	10,000.00
Examination of wool and animal fibers: For testing their textile strength, etc	....do	21	295	1	1881	4,000.00	4,000.00	.....	4,000.00
Experiments in the manufacture of sugar, purchase of machinery, etc	....do	21	295	1	1881	7,500.00	7,500.00	.....	7,500.00
Collecting data touching arid regions of the United States	....do	21	295	1	1881	5,000.00	460.00	4,540.00	4,540.00
Reclamation of arid lands: For artesian wells, etc	....do	21	295	1	1881	20,000.00	18,353.55	.....	18,500.00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	Mar. 3, 1881	21	381	1	1882	79,500.00	79,491.81	8.19	79,500.00
Collecting agricultural statistics	....do	21	382	1	1882	10,000.00	10,000.00	.....	10,000.00
Laboratory: Chemicals, apparatus, etc	....do	21	382	1	1882	6,000.00	5,811.85	188.15	5,811.85
Purchase, propagation, and distribution of seeds, plants, etc	....do	21	382	1	1882	80,000.00	79,991.53	8.47	80,000.00
Experiments in the culture and manufacture of tea	....do	21	383	1	1882	10,000.00	8,750.87	1,249.13	8,980.00
Experimental garden and grounds: For labor, etc	....do	21	383	1	1882	7,000.00	6,968.25	31.75	7,000.00
Museum: For collecting and modeling specimens of fruits, etc	....do	21	383	1	1882	1,000.00	1,000.00	.....	1,000.00
Furniture, cases and repairs	....do	21	383	1	1882	4,000.00	4,000.00	.....	4,000.00
Library: For agricultural works of reference, etc	....do	21	383	1	1882	1,000.00	973.85	26.15	1,000.00
Investigating the history and habits of insects, and to publish reports	....do	21	383	1	1882	20,000.00	19,998.94	1.06	19,827.94
Examination of wool and animal fibers: Testing strength, etc., and publishing reports	....do	21	384	1	1882	5,000.00	5,000.00	.....	5,000.00
Investigating diseases of swine and other domestic animals; $15,000 for pleuro-pneumonia in cattle	....do	21	384	1	1882	25,000.00	22,443.89	2,556.11	22,683.66
Collecting data touching arid region of the United States	....do	21	384	1	1882	5,000.00	4,216.55	783.45	3,877.31
Reclamation of arid and waste lands in United States, including $1,646.45 carried from 1880	....do	24	384	1	1882	11,646.45	11,561.19	.....	11,000.00
Report on forestry	....do	21	384	1	1882	5,000.00	4,941.00	59.00	4,941.00
Postage	....do	21	384	1	1882	4,000.00	4,000.00	.....	2,500.00
Contingent expenses: For incidental expenditures, including $1,000 from appropriation of 1882	....do	21	384	1	1882	11,000.00	10,927.43	.....	11,000.00
Improvement of grounds: For labor, etc	....do	21	385	1	1882	8,000.00	8,000.00	.....	8,000.00
Building for display of agricultural implements	....do	21	385	1	1882	10,000.00	10,000.00	.....	10,000.00
Machinery, apparatus, etc., for the manufacture of sugar, including $864.60 from sales	....do	21	384	1	1882	35,864.60	32,333.75	.....	32,510.00

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive—Continued.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
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Purchase and distribution of seeds among settlers whose crops were destroyed by drought and grasshoppers	May 3, 1881	21	453	1	1881	$20,000.00	$20,000.00	.....	$20,000.00
Transportation of agricultural and mineral specimens from Atlanta	Feb. 13, 1882	22	3	1	1882	5,000.00	4,998.91	$1.09	5,000.00
Purchase and distribution of seeds among settlers in overflowed districts in Mississippi Valley	Apr. 16, 1882	22	44	1	1882	20,000.00	20,000.00	.....	20,000.00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	May 19, 1882	22	89	1	1883	102,580.00	102,575.49	4.51	102,575.49
Collecting agricultural statistics	....do	22	90	1	1883	80,000.00	78,170.80	1,829.20	80,000.00
Laboratory: For chemicals, apparatus, etc	....do	22	90	1	1883	6,000.00	6,000.00	.....	6,000.00
Purchase, propagation, and distribution of seeds, trees, etc	....do	22	90	1	1883	80,000.00	80,000.00	.....	80,000.00
Experiments in culture and manufacture of tea	....do	22	91	1	1883	5,000.00	3,905.66	1,094.34	3,905.66
Experimental garden and grounds: For labor, etc	....do	22	91	1	1883	7,500.00	7,500.00	.....	7,500.00
Museum: For collecting and modeling specimens of fruits, etc	....do	22	91	1	1883	1,000.00	1,000.00	.....	1,000.00
Furniture, cases, and repairs	....do	22	91	1	1883	6,700.00	6,700.00	.....	6,700.00
Library: For agricultural works of reference, etc	....do	22	91	1	1883	1,500.00	1,485.32	14.68	1,500.00
Investigating the history and habits of insects	....do	22	91	1	1883	20,000.00	19,997.75	2.25	19,288.46
Examination of wool and animal fibers: For testing strength, texture, etc	....do	22	91	1	1883	10,000.00	7,961.94	2,038.06	7,764.04
Investigating diseases of domestic animals	....do	22	92	1	1883	25,000.00	21,584.28	3,415.72	21,655.73
Reclamation of arid and waste lands, including $85.26 from last year	....do	22	92	1	1883	20,085.26	12,429.13	.....	12,500.00
Report on forestry	....do	22	92	1	1883	10,000.00	8,731.99	1,268.01	8,479.99
Postage	....do	22	92	1	1883	4,000.00	3,977.49	22.51	1,677.49
Contingent expenses: For incidental expenditures, including $72.57 from last year	....do	22	92	1	1883	14,072.57	13,993.31	79.26	14,000.00
Improvement of grounds: For labor, etc	....do	22	92	1	1883	8,000.00	7,971.82	28.18	8,000.00
Experiments in the manufacture of sugar, including $3,530.85 from last year	....do	22	92	1	1883	28,530.85	28,529.31	1.54	28,354.60
Erection of building for seed division	Aug. 7, 1882	22	306	1	1883	25,000.00	25,000.00	.....	25,000.00
Report on husbandry of Angora goat by Dr. John L. Hayes	....do	22	337	1	1882	500.00	500.00	.....	500.00

Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	Jan. 20, 1883	22	408	1	1884	127,640.00	127,639.87	.13	127,639.87
Collecting agricultural statistics	....do	22	410	1	1884	80,000.00	79,770.86	229.14	79,770.86
Laboratory: For chemicals, apparatus and sugar experiments, including $842.18 from sale of sirup, etc	....do	22	410	1	1884	16,842.18	16,829.26	12.92	16,829.96
Purchase, propagation, and distribution of seeds, trees, etc	....do	22	410	1	1884	75,000.00	74,986.48	13.52	75,000.00
Experimental garden and grounds: For labor, etc	....do	22	409	1	1884	7,500.00	7,486.21	13.79	7,486.21
Museum: For collecting and modeling specimens of fruits, etc	....do	22	409	1	1884	1,000.00	993.51	6.49	1,000.00
Furniture, cases, and repairs	....do	22	410	1	1884	6,000.00	5,998.82	1.18	6,000.00
Library: For agricultural works of reference, etc	....do	22	411	1	1884	1,500.00	1,439.86	60.14	1,500.00
Investigating the history and habits of insects	....do	22	409	1	1884	20,000.00	20,000.00	.....	19,850.66
Reclamation of arid and waste lands, including $7,656.13 from last year	....do	22	411	1	1884	17,656.13	16,164.68	1,491.45	15,838.50
Investigating diseases of domestic animals	....do	22	411	1	1884	25,000.00	24,011.85	988.15	22,500.00
Report on forestry	....do	22	411	1	1884	10,000.00	9,998.30	1.70	9,892.50
Postage	....do	22	411	1	1884	4,000.00	3,841.48	158.52	3,841.48
Contingent expenses: For incidental expenditures	....do	22	411	1	1884	14,000.00	13,991.43	8.57	13,991.42
Improvement of grounds	....do	22	411	1	1884	8,000.00	7,962.66	37.34	8,000.00
Building of greenhouse	....do	22	631	1	1883	2,500.00	2,500.00	.....	2,500.00
Bureau of Animal Industry	May 29, 1884	23	31	1	1885	150,000.00	56,807.73	.....	60,000.00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	June 5, 1884	23	36	1	1885	137,590.00	137,557.80	32.20	137,300.87
Collecting agricultural statistics	....do	23	38	1	1885	100,000.00	99,986.59	13.41	100,000.00
Purchase, propagation, and distribution of seeds, trees, plants, etc	....do	23	38	1	1885	100,000.00	99,983.82	16.18	99,161.80
Laboratory: Chemicals, apparatus, and experiments in the manufacture of sugar	....do	23	38	1	1885	50,000.00	49,996.70	3.30	49,255.98
Investigating the history and habits of insects	....do	23	37	1	1885	20,000.00	19,986.83	13.17	19,803.73
Silk culture	....do	23	39	1	1885	15,000.00	14,916.23	83.77	15,000.00
Contingent expenses: For incidental expenditures	....do	23	39	1	1885	15,000.00	14,862.20	137.80	14,729.37
Report on forestry	....do	23	39	1	1885	10,000.00	9,987.36	12.64	9,646.92
Improvement of grounds: For labor, etc	....do	23	37	1	1885	9,750.00	9,750.00	.....	9,750.00
Experimental garden and grounds	....do	23	37	1	1885	7,350.00	7,023.42	326.58	7,000.00
Furniture, cases, and repairs	....do	23	38	1	1885	6,000.00	5,947.27	52.73	6,000.00
Postage	....do	23	39	1	1885	4,000.00	3,956.98	43.02	3,830.00
Experiments in the culture and manufacture of tea	....do	23	39	1	1885	3,000.00	2,998.90	1.10	2,775.15
Library: For agricultural works of reference, etc	....do	23	39	1	1885	1,500.00	1,403.63	96.37	1,500.00

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive—Continued.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
		Vol.	Page.	Sec.					
Museum: For collecting and modeling specimens of fruits, etc	June 5, 1894	23	37	1	1885	$1,000.00	$1,000.00	.....	$1,000.00
Quarantine stations: For establishing and maintaining same	June 7, 1884	23	207	1	1885	25,000.00	22,029.18	.....	22,000.00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	Mar. 3, 1885	23	353	1	1886	137,590.00	137,337.42	$252.58	137,000.00
Bureau of Animal Industry, including unexpended balance from last year	....do	23	355	1	1886	193,192.27	58,261.05	134,931.22	55,000.00
Quarantine stations, including unexpended balance from last year	....do	23	356	1	1886	32,970.82	18,958.57	14,012.25	19,884.18
Collecting agricultural statistics	....do	23	355	1	1886	75,000.00	68,723.06	6,276.94	65,795.51
Purchase, propagation, and distribution of seeds, trees, plants, etc	....do	23	354	1	1886	100,000.00	99,980.24	19.76	100,000.00
Laboratory: For chemicals, apparatus, and experiments in the manufacture of sugar	....do	23	354	1	1886	40,000.00	39,942.11	57.89	28,054.34
Investigating history and habits of insects	....do	23	354	1	1886	25,000.00	24,976.46	23.54	24,806.81
Silk culture: For experiments in the manufacture of silk	....do	23	356	1	1886	15,000.00	14,996.50	3.50	14,996.50
Contingent expenses: For incidental expenditures	....do	23	356	1	1886	15,000.00	14,937.62	62.38	15,000.00
Report on forestry	....do	23	356	1	1886	10,000.00	9,836.83	163.17	9,813.63
Experimental garden and grounds	....do	23	354	1	1886	8,200.00	8,068.97	131.03	8,118.00
Furniture, cases, and repairs	....do	23	354	1	1886	7,500.00	7,423.59	76.41	7,500.00
Postage	....do	23	356	1	1886	4,000.00	2,556.20	1,443.80	3,000.00
Experiments in culture and manufacture of tea	....do	23	356	1	1886	3,000.00	1,813.67	1,186.33	2,000.00
Library	....do	23	355	1	1886	1,500.00	1,417.03	82.97	1,500.00
Museum: For collecting and modeling specimens of fruits, etc	....do	23	354	1	1886	1,000.00	998.88	1.12	1,000.00
Improvement of grounds: For labor, etc	....do	23	354	1	1886	8,000.00	7,947.78	52.22	8,000.00
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	June 30, 1886	24	100	1	1887	142,890.00	141,420.68	1,469.32	140,500.00
Bureau of Animal Industry	....do	24	103	1	1887	100,000.00	99,985.56	14.44	100,000.00
Quarantine stations: For establishing and maintaining same	....do	24	103	1	1887	30,000.00	10,639.44	19,360.56	10,094.20
Collecting agricultural statistics	....do	24	103	1	1887	65,000.00	64,955.14	44.86	65,000.00
Purchase, propagation, and distribution of seeds, trees, plants, etc	....do	24	102	1	1887	100,000.00	99,998.37	1.63	100,000.00
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8,000.00

Experiments in the manufacture of sugar, including certificate of deposit	....do	24	101	1	1887	95,891.00	95,853.14	37.86	91,274.30
Investigating the history and habits of insects	....do	24	101	1	1887	15,000.00	14,991.80	8.20	15,000.00
Silk culture	....do	24	101	1	1887	15,864.81	15,864.81	.....	10,000.00
Contingent expenses: For incidental expenditures, etc	....do	24	104	1	1887	15,000.00	14,936.83	63.17	15,000.00
Report on forestry	....do	24	103	1	1887	8,000.00	7,953.50	46.50	7,671.26
Experimental garden and grounds: For labor, etc	....do	24	102	1	1887	23,200.00	22,202.15	997.85	22,202.15
Furniture, cases, and repairs	....do	24	103	1	1887	8,125.00	8,092.11	32.89	8,100.00
Postage	....do	24	104	1	1887	4,000.00	3,500.00	500.00	3,500.00
Experiments in the culture of tea	....do	24	104	1	1887	2,000.00	1,753.78	246.22	1,500.00
Pomological information	....do	24	100	1	1887	3,000 00	2,993.20	6.80	2,982.95
Library for agricultural works of reference, etc	....do	24	103	1	1887	1,500.00	1,428.65	71.35	1,500.00
Botanical investigations	....do	24	100	1	1887	5,000.00	4,988.12	11.88	5,000.00
Museum for collecting and modeling specimens of fruits, etc	....do	24	102	1	1887	1,000.00	998.88	1.12	1,000.00
Ornithology and mammalogy	....do	24	101	1	1887	10,000.00	9,999.98	.02	9,286.13
Reclamation of arid and waste lands	....do	24	103	1	1887	5,000.00	.....	5,000.00	.....
Food adulteration	....do	24	100	1	1887	1,000.00	989.14	10.86	1,000.00
Deficiency appropriation for the fiscal years 1884 and 1886	Aug. 4, 1886	24	273	1	.....	971.92	971.92	.....	971.92
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	Mar. 3, 1887	24	495	1	1888	161,490.00	158,220.87	3,269.13	158,500.00
Bureau of Animal Industry, including $100,000 immediately available	....do	24	499	1	1888	500,000.00	499,975.32	24.68	500,000.00
Quarantine stations	....do	24	499	1	1888	20,000.00	9,538.75	10,461.25	9,538.75
Collecting agricultural statistics	....do	24	498	1	1888	65,000.00	64,965.33	34.67	64,965.33
Purchase, propagation, and distribution of seeds, trees, etc	....do	24	498	1	1888	103,000.00	102,587.55	412.45	102,500.00
Laboratory: For chemicals, apparatus, etc	....do	24	497	1	1888	6,000.00	5,969.89	30.11	5,337.19
Experiments in manufacture of sugar	....do	24	497	1	1888	50,000.00	49,997.43	2.57	49,900.00
Investigating the history and habits of insects	....do	24	497	1	1888	20,000.00	20,000.00	.....	19,981.16
Silk culture, including $1,989.06 from sale of raw silk	....do	24	497	1	1888	16,989.06	16,989.02	.04	16,989.02
Contingent expenses: For incidental expenditures	....do	24	499	1	1888	15,000.00	14,825.57	174.43	15,000.00
Report on forestry	....do	24	499	1	1888	8,000.00	7,996.10	3.90	8,000.00
Experimental garden and grounds: For labor, etc	....do	24	497	1	1888	24,800.00	24,706.86	93.14	24,706.73
Furniture, cases, and repairs	....do	24	498	1	1888	7,000.00	6,982.88	17.12	7,000.00
Postage	....do	24	499	1	1888	4,000.00	3,000.00	1,000.00	3,000.00
Pomological information	....do	24	497	1	1888	3,000.00	2,971.69	28.31	2,728.17
Library: For agricultural works of reference	....do	24	499	1	1888	2,000.00	1,983.78	16.22	1,983.09

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive—Continued.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
		Vol.	Page	Sec.					
Botanical investigations	Mar. 3, 1887	24	496	1	1888	$7,000.00	$6,997.28	$2.72	$6,710.36
Museum: For collecting and modeling specimens of fruits	....do	24	497	1	1888	1,000.00	947.41	52.59	947.41
Ornithology and mammalogy	....do	24	497	1	1888	3,940.00	3,869.23	70.77	3,710.00
Food adulteration	....do	24	497	1	1888	1,000.00	830.16	169.84	814.16
Salaries: For compensation of Commissioner of Agriculture, chief clerk, and other employés	July 18, 1888	25	328	1	1889	167,636.14	164,923.34	2,712.80	164,212.87
Bureau of Animal Industry	....do	25	333	1	1889	500,000.00	479,612.17	20,387.83	482,323.23
Purchase, propagation, and distribution of seeds, trees, plants, etc	....do	25	332	1	1889	104,200.00	104,159.30	40.70	104,200.00
Collecting agricultural statistics	....do	25	332	1	1889	65,000.00	64,997.91	2.09	64,197.91
Maps and charts, with reference to crop distribution, etc	....do	25	333	1	1889	5,000.00	4,964.54	35.46	5,000.00
Experiments in the manufacture of sugar	....do	25	333	1	1889	100,000.00	99,970.20	29.80	100,000.00
Experimental garden and grounds: For labor, etc	....do	25	333	1	1889	26,640.00	26,639.83	.17	24,946.77
Quarantine stations	....do	25	333	1	1889	15,000.00	11,628.39	3,371.61	11,525.00
Investigating the history and habits of insects	....do	25	331	1	1889	20,000.00	20,000.00	.....	19,584.34
Silk culture, including $708.26 from the sale of raw silk	....do	25	331	1	1889	23,208.26	23,208.26	.....	23,386.18
Contingent expenses: For incidental expenditures	....do	25	333	1	1889	15,000.00	15,000.00	.....	15,000.00
Report on forestry	....do	25	333	1	1889	8,000.00	7,999.03	.97	7,717.80
Furniture, cases and repairs	....do	25	332	1	1889	7,350.00	7,236.74	113.26	7,350.00
Botanical investigations	....do	25	330	1	1889	35,000.00	34,999.45	.55	35,000.00
Laboratory: For chemicals, apparatus, etc	....do	25	330	1	1889	6,000.00	5,326.00	674.00	5,326.00
Postage	....do	25	333	1	1889	4,000.00	3,985.00	15.00	3,805.00
Pomological information	....do	25	333	1	1889	4,000.00	3,995.84	4.16	4,200.00
Ornithology and mammalogy	....do	25	332	1	1889	4,000.00	3,996.16	3.84	3,700.00
Library: For agricultural works of reference	....do	25	333	1	1889	2,000.00	1,956.34	43.66	2,000.00
Museum: For collecting and modeling specimens of fruit, etc	....do	25	332	1	1889	1,000.00	891.25	108.75	915.34
Food adulteration	....do	25	330	1	1889	1,000.00	999.87	.13	1,000.00
Experiment stations in connection with State colleges	....do	25	334	1	1889	10,000.00	9,033.77	966.23	10,000.00
Deficiency appropriation for the years 1885, 1886, 1887, and 1888	Oct. 19, 1888	25	581	1	.....	8,962.28	8,889.78	72.50	8,889.78

Salaries: For compensation Secretary, Assistant Secretary, and other employés	Mar. 2, 1889	25	835	1	1890	178,580.00	175,547.04	3,032.96	175,547.04
Bureau of Animal Industry	....do	25	839	1	1890	500,000.00	342,565.82	.....	500,000.00
Purchase, propagation, and distribution of seeds, trees, plants, etc	....do	25	839	1	1890	104,200.00	104,174.55	25.45	104,129.74
Collecting agricultural statistics, and for maps and charts	....do	25	839	1	1890	75,000.00	74,260.01	739.99	74,241.81
Experiments in the manufacture of sugar	....do	25	840	1	1890	25,000.00	24,985.30	14.70	25,000.00
Experimental garden and grounds	....do	25	838	1	1890	26,640.00	26,639.83	.17	26,478.45
Quarantine stations	....do	25	840	1	1890	15,000.00	11,266.24	3,733.76	11,500.00
Investigating the history and habits of insects	....do	25	837	1	1890	20,000.00	19,892.72	107.28	19,817.67
Silk culture, including $1,627.81 from sales of raw silk	....do	25	837	1	1890	21,627.81	21,626.10	1.71	21,626.10
Contingent expenses, including $5,000 of a deficiency appropriation made April 4, 1890	....do	25	840	1	1890	20,000.00	19,859.20	140.80	20,000.00
Report on forestry	....do	25	840	1	1890	8,000.00	7,999.96	04	7,927.21
Furniture, cases, and repairs, including $2,000 of a deficiency appropriation made April 4, 1890	....do	25	839	1	1890	9,250.00	9,261.93	88.07	9,350.00
Botanical investigations, including diseases of fruit and fruit trees	....do	25	836	1	1890	35,000.00	34,981.68	18.32	34,623.24
Laboratory: For chemicals apparatus, etc	....do	25	837	1	1890	6,000.00	5,930.18	69.82	6,000.00
Food adulterations	....do	25	837	1	1890	5,000.00	4,531.81	468.19	4,531.81
Postage	....do	25	840	1	1890	4,000.00	4,000.00	.....	4,000.00
Pomological information	....do	25	837	1	1890	4,000.00	4,000.00	.....	4,000.00
Ornithology and mammalogy	....do	25	838	1	1890	7,000.00	7,000.00	.....	7,000.00
Library: For agricultural works of reference, etc	....do	25	839	1	1890	2,000.00	1,738.28	261.72	1,338.28
Museum: For collecting and modeling specimens of fruits, etc	....do	25	838	1	1890	1,000.00	998.39	1.61	1,000.00
Food adulteration	....do	25	837	1	1890	1,000.00	1,000.00	.....	1,000.00
Experimental stations in connection with State colleges	....do	25	840	1	1890	15,000.00	14,991.69	8.31	14,979.69
Deficiency appropriation for the fiscal years 1887 and 1889	....do	25	923	1	.....	4,367.38	4,367.38	.....	4,367.30
Location of artesian wells	Apr. 4, 1890	26	42	1	1890	20,000.00	19,652.17	347.83	20,000.00
Salaries: For compensation of Secretary, Assistant Secretary, and other employés	July 14, 1890	26	282	1	1891	248,902.85	239,923.29	8,979.56	239,923.29
Purchase, propagation and distribution of seeds, trees, plants, etc	....do	26	286	1	1891	105,400.00	105,090.94	309.06	105,490.94
Collecting agricultural statistics, including agricultural maps and charts, $15,000	....do	26	284	1	1891	100,000.00	84,859.29	15,140.71	85,608.86
Experiments in the manufacture of sugar	....do	26	288	1	1891	50,000.00	49,901.18	98.82	49,619.06
Experimental garden and grounds	....do	26	287	1	1891	28,500.00	28,396.41	103.59	28,500.00
Quarantine stations	....do	26	288	1	1891	15,000.00	13,586.72	1,413.28	13,586.72

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive—Continued.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
		Vol.	Page.	Sec.					
Investigating the history and habits of insects	July 14, 1890	26	285	1	1891	$27,500.00	$27,488.83	$11.17	$27,446.33
Document and folding room: For paper, twine, etc	....do	26	287	1	1891	2,000.00	1,995.53	4.47	1,995.53
Illustrations and engravings: For tools, paper, paint, pencils, etc	....do	26	286	1	1891	2,000.00	1,999.58	42	1,999.58
Silk culture, including $565 from sale of raw silk	....do	26	285	1	1891	20,565.00	19,536.33	1,028.67	19,529.84
Contingent expenses; For incidental expenditures	....do	26	287	1	1891	20,000.00	18,097.13	1,902.87	19,898.12
Report on forestry and experiments in production of rainfall	....do	26	286	1	1891	10,000.00	9,996.82	3.18	9,996.82
Furniture, cases, and repairs	....do	26	287	1	1891	10,000.00	9,991.26	8.74	10,000.00
Botanical investigations	....do	26	284	1	1891	40,000.00	36,428.36	3,571.64	36,402.66
Vegetable pathology: For investigating diseases of fruits, fruit trees, etc	....do	26	285	1	1891	15,000.00	14,995.75	4.25	14,975.66
Laboratory: For chemicals, apparatus, rent of building, food adulteration, etc	....do	26	286	1	1891	20,200.00	19,985.27	214.73	20,200.00
Postage	....do	26	287	1	1891	5,000.00	4,833.00	167.00	4,900.00
Pomological information	....do	26	285	1	1891	5,000.00	4,983.88	16.12	4,983.12
Ornithology and mammalogy	....do	26	285	1	1891	15,000.00	14,001.73	998.27	13,715.78
Library: For agricultural works of reference	....do	26	287	1	1891	3,000.00	2,990.99	9.01	3,000.00
Museum	....do	26	287	1	1891	4,000.00	3,832.28	167.72	4,000.00
Microscopy: For apparatus, chemicals, and investigation of the adulteration of foods	....do	26	285	1	1891	5,000.00	3,281.90	1,718.10	3,281.90
Experiment stations in connection with State colleges	....do	26	288	1	1891	15,000.00	14,984.48	15.52	15,000.00
Irrigation investigation	Sept. 30, 1890	26	525	1	1891	40,000.00	39,926.90	73.10	39,926.90
Bureau of Animal Industry, including unexpended balance from 1880	July 14, 1890	26	287	1	1891	507,434.18	441,544.17	65,890.01	429,632.40
Salaries: For compensation of Secretary, Assistant Secretary, and other employés	Mar. 3, 1891	26	1045	1	1892	256,800.00	252,766.17	4,033.83	252,766.17
Purchase, propagation, and distribution of seeds, trees, shrubs, etc	....do	26	1048	1	1892	105,400.00	104,281.90	478.83	105,000.00
Collecting agricultural statistics, including $15,000 for maps and charts	....do	26	1046	1	1892	102,500.00	88,869.51	13,630.49	91,294.97
Experiments in the manufacture of sugar, including $10,000 deficiency appropriated March 18, 1892	....do	26	1050	1	1892	60,000.00	59,580.78	419.22	56,467.84
Experimental garden and grounds, including a deficiency of $122.53, made March 3, 1893	....do	26	1049	1	1892	28,622.53	28,529.22	93.31	28,529.22

Quarantine stations	do	26	1050	1	1892	15,000.00	14,983.63	16.37	14,983.63
Investigating the history and habits of insects	do	26	1047	1	1892	27,800.00	27,599.63	200.37	27,510.43
Document and folding room	do	26	1049	1	1892	2,000.00	1,996.82	3.18	2,000.00
Illustrations and engravings	do	26	1048	1	1892	2,000.00	1,999.85	.15	2,000.00
Contingent expenses	do	26	1049	1	1892	25,000.00	24,747.57	252.43	24,756.64
Report on forestry, including $58.85 of a deficiency appropriation made March 3, 1893	do	26	1048	1	1892	15,056.85	15,017.65	39.20	15,056.85
Furniture, cases, and repairs	do	26	1049	1	1892	12,000.00	11,996.30	3.70	12,000.00
Botanical investigations	do	26	1046	1	1892	40,000.00	40,000.00	.....	39,233.51
Vegetable pathology: For investigating the diseases of fruits, fruit trees, etc	do	26	1047	1	1892	15,000.00	15,000.00	.....	14,971.30
Laboratory, including appropriations for rent and food adulteration	do	26	1047	1	1892	19,400.00	19,272.59	127.41	15,000.00
Postage	do	26	1049	1	1892	5,000.00	4,900.00	100.00	4,900.00
Pomological information	do	26	1047	1	1892	5,000.00	4,985.27	14.73	4,985.27
Ornithology and mammalogy	do	26	1047	1	1892	15,000.00	13,676.31	1,323.69	14,500.00
Library: For agricultural works of reference	do	26	1049	1	1892	3,000.00	2,807.75	192.25	3,000.00
Museum	do	26	1049	1	1892	4,000.00	3,909.17	90.83	3,909.17
Microscopy: For food samples, and investigation into the adulteration of foods	do	26	1047	1	1892	2,000.00	1,251.46	748.54	2,000.00
Experiment stations in connection with State colleges	do	26	1050	1	1892	20,000.00	19,989.47	10.53	19,989.47
Fiber investigations	do	26	1048	1	1892	10,000.00	8,017.44	1,982.56	8,017.44
Irrigation investigations	do	26	1052	1	1892	10,000.00	8,433.34	1,566.66	8,393.86
Bureau of Animal Industry, including a deficiency appropriation of $150,000, made March 18, 1892	do	26	1045	1	1892	650,000.00	649,962.98	37.02	649,506.23
Salaries and expenses: Weather Bureau	do	26	1051	1	1892	182,330.00	164,594.24	17,735.76	164,594.24
Fuel, lights, and repairs: Weather Bureau	do	26	1051	1	1892	10,775.00	10,507.26	267.74	10,775.00
Contingent expenses	do	26	1052	1	1892	13,783.00	13,661.24	121.76	13,783.00
General expenses: Weather Bureau	do	26	1052	1	1892	672,865.50	657,335.90	15,529.60	649,000.00
Salaries: For compensation of Secretary of Agriculture, Assistant Secretary, and other employés	July 5, 1892	27	74	1	1893	256,800.00	253,896.30	2,903.70	255,500.00
Purchase, propagation, and distribution of seeds, trees, plants, etc	do	27	78	1	1893	135,400.00	134,917.87	482.13	135,100.00
Collecting agricultural statistics, including maps, charts, and extension of foreign markets	do	27	76	1	1893	110,000.00	95,470.47	14,529.53	98,112.62
Experimental garden and grounds: For labor, etc	do	27	78	1	1893	28,500.00	28,115.09	384.91	28,500.00
Experiments in the manufacture of sugar	do	27	80	1	1893	20,000.00	19,984.86	15.14	20,000.00

Statement of appropriations and expenditures for the U. S. Department of Agriculture from 1878 to 1892, inclusive—Continued.

For what purpose.	Date of act making the appropriation.	Reference to the Statutes at Large.			For the fiscal year—	Amount of annual appropriation.	Amount disbursed.	Amount unexpended.	Amount expended by warrant.
		Vol.	Page.	Sec.					
Quarantine stations	July 5, 1892	27	78	1	1893	$15,000.00	$12,574.73	$2,425.27	$13,613.66
Investigating the history and habits of insects	do	27	77	1	1893	17,800.00	17,290.80	509.20	18,289.20
Document and folding room	do	27	78	1	1893	2,000.00	1,623.55	376.45	2,000.00
Illustrations and engravings	do	27	78	1	1893	2,000.00	1,906.73	93.27	2,000.00
Contingent expenses	do	27	79	1	1893	25,000.00	22,218.19	2,781.81	24,500.00
Report on forestry	do	27	78	1	1893	12,000.00	11,933.39	66.61	12,000.00
Furniture, cases, and repairs	do	27	79	1	1893	10,000.00	8,931.97	1,068.03	9,500.00
Botanical investigations	do	27	76	1	1893	27,500.00	27,451.55	48.45	27,499.95
Vegetable pathology	do	27	77	1	1893	20,000.00	19,997.38	2.62	20,284,56
Laboratory: For chemicals, etc., and food adulteration investigations	do	27	77	1	1893	19,400.00	16,751.96	2,648.04	18.300.00
Postage	do	27	79	1	1893	5,000.00	3,705.00	1,295.00	3,900.00
Pomological information	do	27	77	1	1893	5,000.00	4,745.94	254.06	4.868.15
Ornithology and mammalogy	do	27	77	1	1893	15,000.00	14,947.77	52.23	15,000.00
Library: For agricultural works of reference	do	27	79	1	1893	3,000.00	2,523.65	476.35	2,600.00
Museum: For collecting and modeling specimens of fruits, etc	do	27	79	1	1893	4,000.00	3,793.67	26.33	4,000.00
Microscopy and food adulteration	do	27	77	1	1893	2,000.00	1,982.98	17.02	2,000.00
Experimental stations in connection with State colleges	do	27	80	1	1893	20,000.00	18,790.15	1,209.85	19,124.24
Fiber investigations	do	27	78	1	1893	5,000.00	4,997.07	2.93	4,642.32
Bureau of Animal Industry	do	27	79	1	1893	850,000.00	724,213.00	125,787.00	713,674.16
Experiments in the production of rainfall	do	27	76	1	1893	10,000.00	4,913.59	5,086.51	5,050.00
Irrigation investigations	do	27	76	1	1893	6,000.00	4,930.67	1,069.33	5,500.00
Salaries and expenses, including a deficiency appropriation of $65.22, Weather Bureau	do	27	81	1	1893	176,395.22	172,876.68	3,518.54	173,000.00
Fuel, lights, and repairs, Weather Bureau	do	27	81	1	1893	9,700.00	8,451.53	1,248.47	9,700.00
Contingent expenses, Weather Bureau	do	27	81	1	1893	13,700.00	11,953.67	1,746 33	13,000.00
General expenses, Weather Bureau	do	27	82	1	1893	698,865.50	683,831.87	15,033.63	711,437.90
Stations on Middle and Thunder Bay islands, Weather Bureau	July 22, 1892	27	255	1	1893	15,000.00	11,727.00	3,273.00	12,500.00
Total from 1878 to 1893 inclusive						13,551,580.73	12,667,095.95	617,896.25	12,778,812.44
Total from 1839 to 1877 inclusive						3,485,200.38	3,366,114.37	119,086.01	3,393,488.38
Grand total						17,036,781.11	16,033,210.32	736,982.26	16,172,300.82

[illegible] $1,000 are still unpaid of the appropriation for 1892.

DIVISION OF RECORDS AND EDITING.

The Division of Records and Editing has issued during the past fiscal year two hundred and five (205) different publications. Fifty-six (56) of these were printed at the Weather Bureau. The remainder were published at the office of the Public Printer. All editions of the above publications aggregate 3,169,310 copies. They contained 10,512 pages. Farmers' bulletins were increased in numbers so as to make it possible to economically reach many readers. The reduction in the cost of printing for this Department during the year as compared with the previous twelve months is nearly $20,000. It is suggested, nevertheless, that an increase in the printing fund is necessary if all the information acquired by the Department through its several divisions is to be promptly printed, published, and disseminated.

In harmony with the Report of the Secretary of Agriculture for 1893, it is urged that the vicious system of promiscuous free distribution of departmental documents should be abandoned. Public libraries, educational institutions, and the offices of States and of the Federal Government might be furnished without cost, but from all individuals applying for the publications of the Department, a price covering the cost of the document asked for should be required. Thus the publications and documents would be secured by those who really desire them for proper purposes. Half a million of copies of the Report of the Secretary of Agriculture are printed for distribution, at an annual cost of about $300,000. Many of these reports apportioned to members of the Senate and House of Representatives remain undistributed. Large numbers of the annual reports of this Department have been found cumbering the storerooms at the Capitol and the shelves of second-hand bookstores throughout the country. All this labor and waste could be avoided if payment of cost price was demanded for all Government publications.

As long as the custom or law requires the annual issuance of half a million of copies of this report, it is obviously the duty of those who make up that document to strive to render it instructive, interesting, and useful to all the people. It ought to contain the results of the researches made in the various bureaus and laboratories during the year, and should be so plainly written and popular in its character as to adapt itself to the practical farmer and be held in esteem by him as a work of reference on agricultural science, practice, and statistics. Such a handbook by the Department of Agriculture, with all purely executive matter eliminated, might prove of infinite service in the advancement and exaltation of the vocation of agriculture throughout the United States.

The chairman of the House Committee on Printing favorably reported a resolution at the last session of Congress providing for the printing of the report of this Department in two parts. As it passed the House

the resolution and the report of the committee, containing a letter from the Secretary of Agriculture with reference thereto, are appended.

[H. RES. 198, to print Agricultural Report for eighteen hundred and ninety-four.]

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Annual Report of the Secretary of Agriculture for the year eighteen hundred and ninety-four be printed. Said report shall hereafter be submitted and printed in two parts, as follows: Part one, which shall contain purely business and executive matter which it is necessary for the Secretary to submit to the President and Congress; part two, which shall contain such reports from the different bureaus and divisions, and such papers prepared by their special agents, accompanied by suitable illustrations as shall, in the opinion of the Secretary, be specially suited to interest and instruct the farmers of the country, and to include a general report of the operations of the Department for their information. There shall be printed of part one, one thousand copies for the Senate, two thousand copies for the House, and three thousand copies for the Department of Agriculture; and of part two, one hundred and ten thousand copies for the use of the Senate, three hundred and sixty thousand copies for the use of the House of Representatives, and thirty thousand copies for the use of the Department of Agriculture, the illustrations for the same to be executed under the supervision of the Public Printer, in accordance with directions of the Joint Committee on Printing, said illustrations to be subject to the approval of the Secretary of Agriculture: *Provided,* That the title of each of the said parts shall be such as to show that such part is complete in itself.

Passed the House of Representatives June 29, 1894.

[Report to accompany H. Res. 198.]

The Committee on Printing have considered House joint resolution No. 198, to print Agricultural Report for 1894, and report same with recommendation that it do pass.

The committee are of the opinion that it is wise to print said report in two parts as provided in the resolution, with contents divided as suggested. This proposed change has been submitted to the Department of Agriculture, and has the approval of the Secretary, as shown by the letter from him herewith submitted.

DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., June 21, 1894.

SIR: I believe that the Annual Report of the Department of Agriculture, distributed to the farmers of the country in such large numbers, could be greatly improved by publishing it in two separate parts, as follows:

Part 1 to contain purely business and executive matter, which it is necessary for the Secretary to submit to the President and Congress.

Part 2 to include such carefully prepared and selected matter, with proper illustrations, as will especially interest and benefit the farmers of the country, excluding everything that belongs to Part 1 and including a general report on the work of the Department, written with special reference to the needs of the farming public.

The advantages of such a division of the report are so apparent that no argument is needed to support them. The plan will give this Department the opportunity to prepare a report which will interest and benefit the farming classes more than anything which has hitherto been issued from it.

If this division is to be made it will be necessary that this Department be notified so that it can give early instructions to the chiefs of Bureaus and Divisions, who will soon begin the preparation of the annual report to be submitted on the 1st of December. I would respectfully suggest, therefore, the incorporation of some provision like that inclosed in the printing bill now under consideration by your committee.

Respectfully yours,

J. STERLING MORTON,
Secretary.

Hon. JAMES D. RICHARDSON,
Chairman Committee on Printing, House of Representatives,
Washington, D. C.

In view of the possibly favorable action of the Senate on the foregoing resolution, the several chiefs of the various bureaus and divisions of the Department of Agriculture have been directed to prepare their reports in accordance therewith. It is believed that the result will supply a more useful, practical, instructive, and popular report than the late method has heretofore furnished to the public.

DEPARTMENT PRINTING OFFICE.

The constantly increasing demands for the printing of various blanks, letter heads, envelopes, circulars, etc., for use in the different divisions and bureaus has been promptly and satisfactorily met by the printing office under the control of this Department. Much of the work is needed for immediate use, and the ability to furnish it without delay demonstrates the efficiency of the present management. This office also prints the packets used in the distribution of seeds, of which, in September, October, and November, 4,747,550 were delivered to the Seed Division. During the year 1892–'93, and for many years previous, the force consisted of 17 employés, working the entire year. In November, 1893, the force was reduced to 7 employés for twelve months and 8 temporary employés for seven months. During the first six months of the present year the number of impressions amounted to 8,210,110, against 5,201,665 during the same period of the preceding year; so that, with half the force, a third more work is now done, and that, too, of an improved quality.

DOCUMENT AND FOLDING ROOM.

The manual labor in this division has been nearly doubled, owing to the largely increased number of publications which have been issued during the past year. Notwithstanding this, the work of the division has been accomplished with celerity and certainty, although the force of employés has been considerably less than during the preceding year.

A record has been kept, for the first time since the establishment of the division, during the entire year, which shows each and every publication mailed from the Department of Agriculture. Three times as many packages were transmitted by the Department through the mails during the year as were sent out during the previous twelve months.

During the year this division committed to the mails of the United States two million two hundred thousand (2,200,000) pieces of franked mail matter.

The correspondence of the Document and Folding Room naturally increased very largely during the year, but it has been handled most efficiently by the clerical force. The entire mailing list of the Department is being revised and compiled so as to eliminate duplications from the mailing list. Already, in this readjustment of that list, duplication and triplication of names have been frequently discovered. One

address, indeed, has been found receiving twelve copies of each publication.

During the year there were purchased two patent mailing machines which will very materially facilitate the addressing of documents.

DIVISION OF GARDENS AND GROUNDS.

The gardens and grounds of the Department of Agriculture, containing forty (40) acres, demand the constant attention of the superintendent and his subordinates. Glass structures cover nearly an acre of this reservation, and necessarily require the closest daily care and labor.

Several of the glass structures are used for the propagation of plants, of which many are used to embellish the grounds; but the larger portion, mainly those of economic value, are distributed throughout the States and Territories. During the last year there were thus distributed 75,000 plants.

The expenditures upon gardens and grounds for the fiscal year are somewhat reduced. At the present rate the salaries are $3,000 less than those of the last fiscal year. It is impossible to make any exact estimates as to the possible miscellaneous expenditures, in the future, of this division. Exigences may occur which can not be computed with any degree of exactness before their necessity arises. In any event the appropriation recommended is deemed sufficient for this division.

OFFICE OF ROAD INQUIRY.

October 3, 1893, in pursuance of the act of Congress appropriating ten thousand dollars ($10,000) "to enable the Secretary of Agriculture to make inquiries in regard to the systems of road management throughout the United States, to make investigations in regard to the best methods of road-making, to prepare publications on this subject suitable for distribution, and to enable him to assist the agricultural colleges and experiment stations in disseminating information on this subject," the Office of Road Inquiry was instituted and Gen. Roy Stone, of New York, appointed to take charge thereof.

During the nine months of the fiscal year the work was necessarily of a tentative character Bulletins Nos. 1 to 9, inclusive, of the Office of Road Inquiry, were collected, compiled, and published. These bulletins have been in such demand that first editions have, in many instances, been exhausted and reprints required.

During the year Gen. Stone, besides attending to the literary work of the office, has attended and addressed conventions and meetings relative to road improvement in various States. It is proposed to increase the work of the office the coming year, to extend the inquiry on the same lines, and to publish maps showing the mileage of improved roads constructed in the United States during the last three years. The coöperation of the agricultural colleges and experiment stations will be

sought, so as to advance and disseminate a knowledge of the economic advantages of good roads and of the best methods of constructing them.

DIVISION OF STATISTICS.

There is no phrase in the English language which, by implication, conveys the impression of so much vast and exact knowledge as the word *statistics*. Literally it means "a state of," "a condition," or "a standing." It depicts, to one accustomed to dwell upon tabulated facts and figures, the mental image of a curious collection of valuable data and figures, caged in mathematical tables, for the purpose of elucidating facts which may be used in the further investigation of special subjects.

Statistical investigations should always be made in accordance with the rule of the theory of mathematical probabilities that "numerical fractions express the value of the degree of presumption in favor of the correctness of a particular event, when the causes or conditions which influenced the result are partly known and partly indeterminate."

Under this theory statisticians arrange results in numerical tables. Facts existing in large numbers are thus compactly and clearly set forth. Statisticians, therefore, should not be content with giving deductions which admit of serious doubts. It is the duty of the statistician to supply credible materials whence anyone may, by examination and reasoning, evolve his own deductions.

But statistics do not consist entirely of columns of figures. Conclusions may be fairly drawn only from well-attested data, though in many instances they may not be susceptible of mathematical demonstration.

The particular object of this division of the U. S. Department of Agriculture is the ascertainment, by diligence and care, of the actual and real condition of the farms and farmers of this country. Its duty is to seek the causes which produced that condition. The utility of ascertaining the condition is in the service which the ascertained facts may render in improving or mitigating, intensifying or repressing, that condition.

A further important utility is found in agricultural statistics, through their elucidation of the relation of the supply of farm products to the demand for farm products in the markets of the United States, and in the other markets of the world. Before the statistician begins an investigation in any certain line he should be sure that the agriculture, commerce, and manufacture of this country need to know the facts which he proposes to gather. And in all researches statisticians should be ready to receive suggestions from those versed, either by experience or observation, in the subject which they consider, and they should be always without prejudice and ready to abandon with alacrity any hypotheses which they find untenable. The statistician's collection of materials should be willingly submitted, on demand, to any new tests which occasion may offer. And no statistician of an economic subject so vast as

that of the agriculture of the United States can approximate the truth with frequency and certainty, unless he has some knowledge of the calculus or computation of probabilities.

Enough has been stated to show that no person can become a successful statistician, an assistant statistician, the chief of a section in the Division of Statistics, or even a thoroughly competent clerk in that division, who is not well posted in the literature of European and American statistics. It is quite plain also that each person engaged in making up statistics for American use, from foreign tabulations, should be perfectly acquainted with the metric system of weights and measures. In that system all foreign statistics, except those of Great Britain, are computed.

COMPETITIVE EXAMINATIONS.

There is no line of investigation which requires more intellectual discipline, more accuracy of judgment, more patience in research, more skill in combining and correlating facts and figures, or more special training for its pursuit, than the line followed by the painstaking and successful statistician. Holding such opinions, the Secretary of Agriculture is convinced that every person employed in gathering statistics under the chief of that division should be admitted to that work only after a thorough, exhaustive, and successful examination at the hands of the U. S. Civil Service Commission. Therefore, he has called for such examinations, by that honorable body, of candidates for the positions of assistant statistician and for chiefs of sections in the Division of Statistics. When these examinations transpire, any employés now in that division of the Department of Agriculture are at liberty, with other competitors, to test their peculiar fitness and adaptation for that work by submitting to the examination.

It is quite certain that their long experience with the facts and figures that are received from day to day in that division will be no disadvantage to them in the contest with outsiders, who have had no such contact.

STATE AND COUNTY AGENTS.

A fundamental objection to the present system of gathering agricultural statistics in the United States is the fact that correspondents, who are expected to furnish reliable data, are paid nothing for their work. The Government is endeavoring to get something for nothing. The only payments (for services) made to these thousands of correspondents in all the counties of each State and Territory are public documents, garden seeds, and a few postage stamps.

The service has been very much better than its compensation. In the several States and counties have been found very many zealous and enthusiastic men anxious to do this work. But they are the exception. Human nature, as a rule, is not desirous of doing diligent duty in any line without remuneration.

In addition to the county agents, the Federal Government has a State statistical agent in each State and Territory of the Union. The salaries for these agents range from $400 to $1,200 per annum each. As a rule they are competent and accomplished men, but the service would be vastly improved if all these appointees were placed in the classified service, so that hereafter, when a vacancy occurs, the person appointed to fill it shall have passed an examination before the U. S. Civil Service Commission, demonstrating his fitness and adaptability for the proper discharge of the duties pertaining to the position.

WORK OF THE YEAR.

The Division of Statistics is, for convenience of administration, divided into four sections, as follows: Compilation and foreign statistics; answers to Congressional inquiries and all verification of agricultural statistics are conducted in this section. Records, files, and correspondence; the title of this section clearly expresses the nature of the duties assigned to it. Crop reporting, which covers all investigations into crop conditions, and collecting and tabulating the reports of correspondents. Freights; the work of this section consists in cross-checking the compilation of crop reports, computations, and freights.

The total expenditures in behalf of the Division of Statistics, including salaries of employés, during the last year, were one hundred and ten thousand dollars ($110,000).

During 1894 the Division of Statistics has enlarged its work upon the crops of the United States. The data for the final report for 1893, containing estimates as to the area, product, and value of the principal crops, were secured by the issuance of 135,000 interrogative circulars addressed to farmers and others who were selected for their high character and intelligence.

Early in 1894 the usual investigation was made as to probable changes in the areas of the principal crops of the Republic, and the results of those inquiries were published in the report for May. The annual inquest as to the quantity of corn and wheat in farmers' hands on the first day of March was thoroughly made, and the facts found were published in the report for March. It contained also a comparison with the corresponding data for a number of previous years and a review of the production and distribution of the several cereals for a term of years. Since then a carefully prepared review of the "supply and distribution of wheat for twenty-five years" was given to the public. A tabulated statement showing the wholesale prices of a number of principal agricultural products at leading cities in all sections of the United States was also presented in the report of the Statistician for March, 1894.

Careful inquiry has been made as to the cost per bushel of producing wheat and corn. Replies from thirty thousand (30,000) farmers and four thousand (4,000) experts were received. Their findings were

published by States and by sections. The State findings were those of experts, and the findings as to particular sections were by leading farmers.

Two other inquiries made by the Division of Statistics were of great interest. The first related to the average weight of wool fleeces in the United States, and the second was relative to the health of the people in the several States and Territories, and was issued for the purpose of ascertaining the diseases most prevalent in each.

The annual table of the world's wheat crop published by this division consists in part of official figures, and in part of such unofficial estimates as are deemed worthy of confidence. This table has been gradually increasing in correctness and accuracy. Its composition is a work of great care and diligent research, involving examination of reports in many languages.

In addition to these customary reports and publications, much time was spent in the preparation of special reports on a variety of subjects of interest to farmers and business men, which, as usual, found a place from time to time in the monthly reports.

AN ANNUAL AGRICULTURAL CENSUS.

Is it not probable that satisfactory statistics of the agriculture of the United States could be better obtained through State authorities? Each Commonwealth, in its labor bureau, or in some other of the executive branches of its government, could establish a properly paid bureau of statistics, and through county agents gather reliable data quickly. The statistics thus collected would be sent by the commissioners in charge of statistics at the several State capitals directly to the Agricultural Department. In that manner possibly a more thorough, reliable, and credible collection of agricultural statistics might be made. If the tables are worth making at all, they are worth making correctly and credibly. If, however, the present system is to be continued, advantages would result from an annual census of agricultural acreages and crops. It is needed as a basis for even approximate accuracy in estimating crop conditions. To give the average condition of any crop in any State certain average weights are applied to each county estimate. Such weights should of course be based on the acreage of each crop in each county. As a fact, they are obtained apparently from acreages reported by preceding United States census, regardless of the increase or decrease from year to year in each county of the area devoted to the several crops. This fundamental fallacy seems to have permeated the agricultural statistics for many years, and it is clear that there must be only guarded and limited faith in the possible accuracy of the crop estimates of the Division of Statistics up to a very recent period of time. Effectual elimination of all possibility of such erroneous calculations is only feasible by means of such an annual census of acreages, which might be taken by some of the experienced men who now report

to the Department, provided they are paid for the work. The precise information desirable by the taking of this census is as follows:

(1) The area under each of the more important crops.

(2) The aggregate product of each of such crops.

(3) The quantity of wheat and corn in the hands of farmers at a date after the spring sowings and plantings and before the beginning of harvest; and also the quantity of cotton and tobacco remaining in the hands of planters, either at the same date or at some other designated time.

(4) The number of farm animals on the 1st of January of each year.

Such a census, to be carefully made by practical men, experienced in agriculture, who may be selected out of the large number of competent persons who have been doing gratuitous work in this line for many years, is very much favored by Mr. Henry A. Robinson, the efficient chief of the Division of Statistics. He estimates that the actual cost of collecting for the census certain agricultural statistics, which may be considered about equivalent as regards the labor of collection to those just proposed, would be not far from five hundred thousand dollars ($500,000), and desires that an appropriation of that sum for the work of collecting such statistics during the fiscal year ending June 30, 1896, be made.

In Great Britain the agricultural statistics are as nearly correct as possible, because each farm is accounted for as to the amount of acreage in each crop and as to the number of domestic animals of each species. Furthermore, the yield of each sown or planted crop, per acre, is given, together with the number of poultry, eggs, and pounds of butter produced—all of which is signed by either the tenant farmer or the proprietor. This exactness is reached through the revenue systems of foreign countries. It might possibly be approximated in the various counties and States of the American Union through similar agencies, or by United States revenue collectors and their deputies.

THE GRATUITOUS PROMISCUOUS DISTRIBUTION OF SEED.

The Secretary of Agriculture calls attention to the report of this Department for the year 1893, and particularly to page 17 thereof, under the head of "Distribution of seed at the public expense."

Briefly, he recommends that the purchase of seeds for gratuitous and promiscuous distribution be utterly abolished, and that not one cent be appropriated for such distribution.

During the fiscal year ending June 30, 1894, the Seed Division gave out to Senators, Representatives, and Delegates in Congress seven million four hundred and forty thousand nine hundred and eighteen (7,440,918) papers of vegetable seeds, six hundred and forty thousand and sixty-five (640,065) papers of flower seeds, sixty-three thousand seven hundred and forty-six (63,746) papers of tobacco seed, one hundred and eighty-two thousand five hundred and forty-two (182,542) papers of turnip seed, thirty-five (35) quarts of mangel-wurzel seed,

five hundred and twenty-one (521) quarts of sugar-beet seed, four thousand eight hundred and seventy-three (4,873) quarts of rape seed, fifty (50) quarts of oats, twenty-five (25) quarts of sorghum, eleven thousand seven hundred and six (11,706) quarts of corn, ten thousand one hundred and sixty-six (10,166) quarts of grass seed, nine thousand two hundred and ninety-three (9,293) quarts of clover seed, and twenty-one thousand one hundred and sixty-six (21,166) quarts of cotton seed.

In that distribution there were one hundred and seventy-seven (177) varieties of vegetable seed, sixty-five (65) of flower seed, seven (7) of tobacco, one (1) of wheat, five (5) of corn, three (3) of oats, one (1) of barley, five (5) of grass, four (4) of clover, six (6) of sorghum, one (1) of Kaffir corn, one (1) of Jerusalem corn, two (2) of millo maize, two (2) of soja beans, one (1) of cowpeas, one (1) of flat peas, one (1) of serradella, one (1) of spurry, one (1) of hairy vetch, one (1) of rape, eight (8) of turnips, three (3) of sugar beets, one (1) of mangel-wurzel, one (1) of peanuts, and ten (10) varieties of cotton.

In the distribution, Senators, Representatives, and Delegates in Congress sent out eight million three hundred and eighty-five thousand one hundred and twenty (8,385,120) packages; county statistical correspondents of the Agricultural Department, five hundred and seven thousand six hundred and sixty-one (507,661); State statistical agents of the Department, one hundred and forty-one thousand one hundred and twenty nine (141,129); experiment stations and experimental farms, fifty-two thousand two hundred and twenty-eight (52,228); agricultural associations and miscellaneous applicants, four hundred and sixty-nine thousand one hundred and eighty (469,180). So that the aggregate number of packages of seed gratuitously distributed by the Government of the United States in the fiscal year is nine million five hundred and fifty-five thousand three hundred and eighteen (9,555,318).

The cost of this enormous distribution, not including the carriage of the packages (which amount in weight to more than three hundred tons), as dead matter by the postal service, is as follows:

For the purchase and distribution of seeds	$111,242.51
Payment of statutory salaries in Seed Division	12,400.00
Making a total of	123,642.51

That total is divided as follows:

Paid out for seed	$56,968.66
Paid out for freight and express charges	2,858.97
Paid out for grain bags	182.08
Paid out for salary and expenses of special agent	3,010.59
Cost of seed delivered at Department	63,020.30

After the reception of the seed the Department paid—

For labor in the seed room (laborers' roll)	$34,690.75
Skilled labor	5,643.99
Paper bags, twine, tags, and other supplies	7,887.47
Statutory salaries	12,400.00
Cost of preparing seed for distribution	60,622.21

The above statement shows that $60,622.21 was spent in preparing seeds for distribution—a sum in the aggregate lacking less than $3,000 of the cost of the seed delivered.

The cost per package of seed distributed is 1.29 cents, against 2 cents for the preceding year.

During the fiscal year 1892–'93 the number of seed packages distributed was seven million seven hundred and four thousand four hundred and sixty-four (7,704,464); and during the year 1893–'94, the number of packages distributed is nine million five hundred and fifty-five thousand three hundred and eighteen (9,555,318). The total expenditure for the fiscal year 1892–'93, including the statutory salaries and compensation of others detailed to this work, was one hundred and sixty thousand dollars ($160,000), and for the year 1893–'94 one hundred and twenty-seven thousand seven hundred and eight dollars ($127,708).

The extravagance and inutility of these disbursements are apparent to any person who will investigate the results of the expenditure. That the distribution is regarded with very little interest, is evidenced by the fact that, taking nine millions of papers of seed, there is an average of five papers to each person, for it is safe to say that there were 1,800,000 citizens of the United States who received seeds out of this promiscuous distribution. Out of this number nine hundred and forty (940) persons acknowledged their receipt, and in those cases it was generally with a request for more seed. The State of Iowa sent 35 acknowledgments, Kansas 30, Connecticut 16, New Jersey 2, Nebraska 33, New York 62, New Hampshire 5, Rhode Island 1. The other States indicate about the same degree of indifference, so that there are less than one thousand acknowledgments by more than one and three-quarter million recipients.

In view of the above, it is difficult to see how any practical statesman can advocate an annual disbursement of $160,000 for such a purpose. Educationally, that sum of money might be made of infinite advantage to the farmers of the United States if it were expended in the publication and distribution of bulletins showing, in terse and plain language, how chemistry, botany, entomology, forestry, vegetable pathology, veterinary, and other sciences may be applied to agriculture.

If, in a sort of paternal way, it is the duty of this Government to distribute anything gratuitously, are not new ideas of more permanent value than old seeds? Is it a function of government to make gratuitous distribution of any material thing?

No estimate has been made for an appropriation for the purchase of seeds for the next fiscal year. If it is deemed best to make such an appropriation, it is recommended that $500 be allotted to each one of the experiment stations of the several States and Territories, which for forty-eight (48) stations would amount to $24,000. Such a law should provide that each station purchase such new and improved varieties of seeds, cuttings, and bulbs as, after examination, may seem

to its director probably adaptable to the soil and climate of the State in which his station is located. If there ever was any sound statesmanship in this gratuitous distribution of seed, which has already cost the Government of the United States several millions of dollars, the reason and necessity for such distribution was removed when the experiment stations were established in the several States and Territories. Those stations are in charge of scientific men. They are, therefore, particularly well equipped for the trial, testing, and approval or condemnation of such new varieties as may be introduced from time to time.

LIBRARY.

Since the present librarian, Mr. W. P. Cutter, who was certified by the United States Civil Service Commission, took charge of the library of the Department of Agriculture modern methods have been introduced, for the first time, into its conduct. A dictionary catalogue has been instituted, and the books have been arranged in a regular system, in accordance with which the valuable material in it will be made available for students. The increased appropriation has been used to fil out the fragmentary sets of scientific periodicals and to purchase works bearing upon the sciences studied by the Department experts. A reading room has been arranged and increased facilities provided for the convenience of investigators. The library has been made in this manner a working laboratory instead of a miscellaneous storehouse.

OFFICE OF FIBER INVESTIGATION.

A report on the uncultivated bast fibers, such as are found upon the inner bark of plants, was completed during the year by the Office of Fiber Investigations, and also a paper on the method of tillage and manufacture of ramie, which contains careful estimates of the cost of instituting ramie plantations, with reliable figures as to the probable or possible yield. The inquiry as to the production of flax in the region of Puget Sound, Washington, has been continued. Flax grown in that region during the past season has been retted and prepared. Though the local agents engaged in this work did not—because of lack of experience—perfectly perform their duties, nevertheless, practical flax planters, who examined their product, have declared that Washington flax would produce, with skillful treatment, a very fine quality of fiber.

DIVISION OF MICROSCOPY.

Studies have been continued in this division upon the edible and poisonous mushrooms. These investigations have aimed to discriminate between edible and nonedible varieties and to give the people of the country plain and safe directions by which they might know them. It is hoped that in this way our neglected resources among these fungi may become better known and more used. For the purpose of giving

assistance to amateurs in mushroom culture experiments have been made to ascertain the better method of cultivating mushroom spawn.

Investigations on butter and butter fats have also been continued. Requests are constantly received from official chemists, chemists of State boards of health, etc., for information or assistance with regard to the identification of oleomargarine, butterine, and the various lard substitutes, and for discriminating between the different lubricating oils, etc.

Nearly two thousand careful measurements of the length of fibers of the cotton staple, domestic and foreign, and the average, together with the maximum and minimum lengths, has been recorded.

OFFICE OF IRRIGATION INQUIRY.

The chief of the Office of Irrigation Inquiry passed the earlier months of the year in Nevada, California, Arizona, New Mexico, and Utah collecting information as to the modes of irrigation most successfully used in those States and Territories. In that tour relations were established between this office and the people directly interested in this system of cultivation, from which it is hoped good may come in the way of additional practical information. It is believed that all those engaged in farming in the arid and subarid regions where irrigation is practiced may soon be brought into immediate correspondence with the Department.

The office has given some attention to the study of percolation and evaporation in the Rocky Mountain regions, where the annual snowfall is the source of many of the streams which fertilize the plains below.

BUILDINGS.

Neither the character nor the condition of the buildings of the Department can be truthfully commended. There are many wooden structures in the rear of the main edifice which are a constant menace, because of the combustible materials of which they are constructed. The laboratories in and about these buildings are constantly using alcohol, gas, oils, ether, and other inflammable and explosive substances. It is therefore imperatively necessary that such laboratories, together with all divisions which by their experiments may possibly create conflagrations, should be removed from these Government buildings.

In view of the tinder-box character of the subsidiary buildings of the Department, it is recommended that all the laboratories and shops be removed to rented brick buildings across the street, in the rear of the Department grounds, provided said buildings can be secured by a reasonable annual outlay of the public money.

The act creating this Department declares as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby established at the seat of Government a United States Department of Agriculture, the general designs and duties of which

shall be to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants.

But there was no building provided for the Department of Agriculture under that act, and rooms were assigned to the Commissioner and his employés in the basement of the Patent Office, where they remained six years. In 1867 one hundred thousand dollars ($100,000) was appropriated for the present main building of the Department, and it was occupied in 1868. From that time, with a few minor changes in the interior, this building has remained practically unchanged. It is 170 feet long by 61 feet in breadth. It has a basement, three full stories, and an attic. This building contains, exclusive of halls, 6,860 square feet of available floor space in the basement; 5,800 square feet on the first floor; on the second floor, including the galleries in the library, there are 10,344 square feet; on the third floor, 2,384 square feet; and there are 4,558 square feet in actual use in the attic, aggregating in occupancy at present, 29,946 square feet of floor space. The basement, two-thirds of which is below the surface of the ground, contains the boiler and fuel rooms, the storerooms of the Property Division, the laboratory of the Division of Ornithology and Mammalogy, the post-office, and the printing office; and in this ill-lighted and badly ventilated place from 25 to 30 people, including the engineers and firemen, are almost always at work.

The library requires the larger portion of the second and third floors of the building. Little space, relatively, is used for the offices of the Secretary, Assistant Secretary, and chiefs of division. The attic of the main building contains the offices and laboratories of two of the most important divisions. Excessive heat and defective ventilation are unavoidable in these apartments.

The building, just described, was erected to accommodate the Bureau of that date, composed of four divisions and employing fifty (50) persons. Those divisions, with the laboratory and Museum, fully occupied the building at the time of its completion. Pressure for space becoming greater from year to year, and adequate appropriations for the erection of substantial buildings having failed, the Department has been forced to erect cheap wooden structures upon the grounds. In such buildings is sheltered much valuable property. The Museum building cost about ten thousand dollars ($10,000). A better building to burn could not be invented or constructed, and yet it contains a Museum which, on the market, is worth at least one hundred thousand dollars ($100,000). Annually the Government is paying more than seven hundred thousand dollars ($700,000) for agricultural experiment stations in the several States and Territories. The cost of a central office in this Department for collating, compiling, and publishing the reports of these stations is each year twenty-five thousand dollars ($25,000). The chief records of the Office of Experiment Stations are compiled and stored in

this combustible wooden Museum building. In it are stored the records of the results of agricultural experiments for which the U. S. Government has already paid out nearly five millions of dollars ($5,000,000). The same building contains the publications of the Department and the offices of several important divisions, together with all the valuable data which each has acquired.

In wooden buildings of equally combustible character are housed the testing laboratory of the Division of Forestry; the carpenter shop; stores of seeds; soil samples, collected at no inconsiderable expense from all parts of the Republic; and all tools and implements used by the superintendent of gardens and grounds and the various scientific bureaus.

As the work of the scientific divisions multiplied it became necessary some years ago to rent two private buildings on B street SW. One of them is occupied by the laboratory of the Bureau of Animal Industry, and the other is the domicile of the Chemical Laboratory of the Department. For the first-mentioned building is paid $1,200 per annum rent, notwithstanding the Government preliminarily expended about $6,000 in adapting the various rooms for present purposes and fitting them with gas, laboratory desks, steam, and water. The Chemical Laboratory building costs $75 per month rent, although the Government had expended $4,500 thereupon in making similar improvements. There is hardly a university or agricultural college in the United States which has not better constructed, better lighted, and better ventilated laboratories than those used by the Department of Agriculture.

Since its removal from the Patent Office, twenty-six years ago, and its establishment as a Department, only one hundred and fifty-four thousand dollars ($154,000), have been appropriated for buildings for its use, exclusive of the Signal Office building purchased while that office was in the War Department. During the same number of years other Departments of the Government have expended for the erection of buildings in the city of Washington, up to June 30, 1894, inclusive, $19,126,826.09.

In view of the fact that the Department of Agriculture is maintained to educationally supervise that industry which furnishes the solid, fecund source of the revenues whence all that vast sum of money was derived, it may not be inappropriate to suggest more commodious accommodations for its further development and usefulness.

The Weather Bureau, at the corner of Twenty-fourth and M streets, is too remote from the Department to receive that personal daily supervision of the Secretary which its magnitude and importance require. It is evident that this valuable property which the Government now owns, and upon which the Weather Bureau building stands, could, if authorized by law, be sold very advantageously. It is believed that it would probably bring a sum of money sufficient to erect substantial buildings for the Department of Agriculture, wherein the Weather

Bureau and all the other divisions and laboratories might be suitably provided for.

With the more than seven hundred thousand dollars ($700,000), saved since March 7, 1893, from the regular appropriations to this Department and covered back into the Treasury of the United States, and the amount the Weather Bureau property would certainly bring, it does seem that buildings commensurate with the relative value which agriculture bears to other vocations and pursuits might be erected at an early day.

FARM PRODUCTS AND THE MONEY THEY BRING.

It will no doubt prove a matter of infinite pride and satisfaction to the real farmers—the practical agriculturists—of the United States to learn that, out of the total exports of this country for the fiscal year 1894, including the products of the mine, of the forest, of the fisheries, of the manufactories, together with every miscellaneous commodity—amounting to eight hundred and sixty-nine million two hundred and four thousand nine hundred and thirty-seven dollars ($869,204,937)—farm products aggregate a value of six hundred and twenty-eight million three hundred and sixty-three thousand and thirty-eight dollars ($628,363,038). All the other exports in that year from this Republic amount to only two hundred and forty million eight hundred and forty-one thousand eight hundred and ninety-nine dollars ($240,841,899). This proves that for the fiscal year 1894 the exports evolved by farmers from the farms of the United States were 72.28 per cent, in cash value, of the total exports of the American Republic for that period of time. This is demonstrated by the following table:

	Amount.	Per cent.
Agriculture	$628,363,038	72.28
Mining	20,449,598	2.35
Forest products	28,010,953	3.22
Fisheries	4,261,920	.49
Manufactures	183,718,484	21.14
Miscellaneous commodities	4,400,944	.52
	869,204,937	100.00

European markets and all the other markets of the world are demanding from the American farmer the very best quality of breadstuffs and meats. They demand them inspected, and governmentally certificated to be of the highest sanitary, nutritive, and edible quality. But farm products have only a specific purchasing power. They will only buy money of people who desire farm products. The farmer exchanges these results of his labors, which have a specific purchasing power, for money, which has a general purchasing power. It is important, therefore, to farmers everywhere that they demand money for their products which has the highest general purchasing power throughout all the

civilized world. It is as vital to the American agriculturist that the currency of his country should be on the basis of the highest and most universally recognized measure of value as it is to the reputation of American farm products in all the world's markets that they be of the most desirable quality.

FOR PRIME PORK GIVE US PRIME CURRENCY.

Would the six hundred million dollars' worth of farm products from the United States sold last year to foreign nations have been as remunerative to the American farmer if they had been paid for in silver as they have been when paid for in gold or its equivalent?

When the standard coin of the Republic shall be made of metal worth as much after it is melted as it purports to be worth in coin, and the mint value and the bullion value of all coined money is nearly the same, will not the American farmer and all other citizens become more permanently prosperous?

If the American farmer, laborer, and manufacturer are compelled by law to submit to the measurement of the value of the products of their efforts by a silver standard, will not the foreigner in buying those products always use the same measure? With his beef, pork, and cereals, the American farmer *buys* money, and why should he not demand as superlative quality in that which *he buys* as the domestic and foreign purchasers insist upon, in that which *he sells?* If those buyers demand "prime" beef and "prime" pork, why should not the farmer demand "prime" currency, the best measure of value, the most fair and facile mediation of exchanges, in the most unfluctuating money which the world of commerce has ever evolved?

In closing his report for the fiscal year 1893 the Secretary of Agriculture said:

> A year from this time, it is hoped, after consultation with the Congressional committees and other representative forces which are endeavoring to educationally develop and define duties for this Department, that useful progress in the right paths may be truthfully reported.

Therefore the foregoing statements as to the practical workings of the Department are this day submitted as a partial fruition of the hope then earnestly and sincerely expressed.

J. STERLING MORTON,
Secretary.

U. S. DEPARTMENT OF AGRICULTURE,
Washington, D. C., November 20, 1894.

REPORT OF THE CHIEF OF THE WEATHER BUREAU.

SIR: I have the honor to transmit herewith a report on the work of the Weather Bureau during the fiscal year ending June 30, 1894.

Very respectfully,

MARK W. HARRINGTON, *Chief.*

Hon. J. STERLING MORTON,
Secretary.

GENERAL FEATURES FOR THE YEAR.

COST OF ADMINISTRATION.

The administration of the Bureau during the fiscal year ending June 30, 1894, has cost 14 per cent less than the appropriation, and less than any previous year but one in the history of the meteorological service since 1881. For that and the previous years it is not practicable to obtain the cost of this service without recasting the accounts item by item. The financial history of this service since 1881 is given in the following table:

Financial history of meteorological service from 1882 to 1894, inclusive.

Fiscal year ending June 30—	Amount appropriated.	Amount expended.	Deficiency.	Amount returned to Treasury.
1882	$988, 615. 80	$988, 615. 80	.....	.....
1883	993, 520. 00	993, 520. 00	.....	.....
1884	958, 034. 57	984, 451. 30	$26, 416. 73	.....
1885	954, 517. 88	966, 076. 44	11, 558. 56	.....
1886	955, 740. 80	960, 812. 06	5, 071. 26	.....
1887	892, 290. 42	902, 042. 67	9, 752. 25	.....
1888	887, 503. 85	909, 410. 74	21, 906. 89	.....
1889	845, 896. 27	853, 396. 27	7, 500. 00	.....
1890	801, 122. 59	810, 622. 59	9, 500. 00	.....
1891	813, 046. 53	877, 659. 80	64, 613. 27	.....
1892	889, 753. 50	* 830, 783. 33	.....	* $55, 000. 00
1893	908, 595. 50	* 892, 805. 20	.....	* 15, 000. 00
1894	951, 100. 00	* 812, 711. 60	.....	* 138, 500. 00

* Estimated. Accounts not yet permanently closed.

This reduction in expenditures was made in accordance with your instructions and has not resulted in the impairment of the efficiency of the work of the Bureau. The rapid growth of the two preceding years ceased, but, within these limits, the efficiency of the Bureau has never been greater. Some noteworthy cases of service to the public have occurred in this fiscal year and are referred to in the following pages.

METHODS OF PROMOTION.

Several important positions in the Bureau have been filled during the past year by competitive examinations, either thrown open free to all citizens or among those of the lower grades whose rating was the highest. The results have been very satisfactory and the introduction of this principle of promotion has had a beneficial effect on the observers. The examinations so far have been for forecast officials, and the doubts entertained by many whether capacity in forecasting could be satisfactorily tested by examination have been set at rest. The examinations so far have been conducted by the Bureau itself, because this method of finding suitable persons for forecast duty was considered experimental. An additional guaranty against bias would be given by having these examinations conducted by the Civil Service Commission, with the provisions required by statute, and this I would earnestly recommend.

Promotions in lower grades have not yet been submitted to the requirements of competitive examination, but the principle has been adopted by the chief of the Bureau of recommending for promotion observers who have performed services of special and noteworthy value to the public. This was the case with Mr. James P. Sherry, to whose alertness was due the saving of the *Rappahannock*, as noted on page 86. While this principle of promotion affords a stimulus to efficiency and alertness on the part of observers it can be applied only occasionally. It would be well for the Bureau if in addition to this some method of general application could be put in force for the regulation of promotions, and there appears to be nothing so fair as competitive examination, the competitors to be determined by their rating. Should the Civil Service Commission be willing to undertake the necessary labor, though not required of them by statute, I would recommend that this be done. If not, it could be well performed by a board of appointment and promotion constituted on such principles of permanency and freedom from bias as would obtain the confidence of those whose affairs it administered.

I have already had the honor to recommend to you by letter (March 28, 1894) that the merit system be also applied to appointments and promotions in the messenger force in this Bureau. I respectfully urge these reforms because I believe that once introduced they would both render administration easier and, by their moral effect, increase the efficiency of the Bureau without increase of cost.

PUBLICATIONS.

Of the periodical publications of the Bureau, there have been issued during the year 2,600,000 weather maps outside of, and 229,112 in, Washington City. The total issue of the Weather Crop Bulletins for the same time was 71,266; of Snow Charts, 13,194; and of Lake Storm Bulletins, 33,000.

The issue of the Monthly Weather Review has numbered for the year 43,301 copies. This publication is now in its twenty-second year, and its series of volumes form a compendium of the meteorology and climate of the United States which is invaluable to all students of the subject. Several improvements have been introduced into it during the past year.

The First Annual Report of the Chief of the Weather Bureau was published during this year. It is quarto in size and the data are

arranged in the form, so far as our system permits, used by other national weather services. This volume has met with so favorable a reception as to demonstrate its great utility. It contained the data for 1891 and 1892. It will be followed by a volume for 1893.

Weather Bureau Bulletin No. 11, Part I, contains about one-third of the papers presented to the International Meteorological Congress, held at Chicago at the time of the World's Fair. Bulletin A is a summary of international meteorological observations, prepared by Major Dunwoody. It is in atlas form, as are all the bulletins, bearing letters instead of numbers. Bulletin B relates to the currents of the Great Lakes as deduced from the movement of bottle papers, and is by myself. The Bureau also issued a wreck chart of the Great Lakes, showing the location of wrecks occasioned through founderings, gales of wind, fogs, and general stormy weather conditions from 1886 to 1893.

A circular of information entitled Protection from Lightning, by Mr. A. McAdie, was issued during this year. Of this 25,000 copies were printed and the supply is already nearly exhausted.

A variation on our usual publications is to be found in the weather maps for December 14–16, 1893, reprinted to form a wall map for use in schools and designed to show the movement of areas of high and low temperature and method of forecasting the same. This was done to fill the growing demand of teachers.

Preparations have begun for the regular issue of a climatic sanitary publication of the same general character as the Monthly Weather Review.

A matter of much embarrassment in connection with our publications is that of their distribution to unknown persons who ask for them without cost. The publications are intended for those to whom they would be of use, and the fact of asking creates a presumption in favor of the one who asks. Yet there is abundant evidence that requests sometimes are made without good reason, though an inquiry concerning his use for them addressed to one requesting publications is likely not only to fail in getting the information requested but also to be resented. These difficulties could be avoided by setting a price on our publications to all except employees, voluntary assistants, libraries, or public officers. Such a price need only cover the cost, with 10 per cent added.

ADMINISTRATIVE DETAILS.

STATIONS AND CHANGES.

At the close of the fiscal year the Weather Bureau observing stations (i. e., paid stations, exclusive of cotton region, wind-signal display, and other "special" stations) were 156 in number, distributed as follows: In Alabama, 2; Arkansas, 2; Arizona, 2; California, 8; Colorado, 4; Connecticut, 2; Florida, 6; Georgia, 3; Idaho, 1; Illinois, 3; Indiana, 2; Iowa, 5; Kansas, 4; Kentucky, 1; Louisiana, 2; Maine, 2; Maryland, 1; Massachusetts, 4; Michigan, 6; Minnesota, 5; Mississippi, 2; Missouri, 5; Montana, 3; Nebraska, 3; Nevada, 2; New Jersey, 2; New Mexico, 1; New York, 6; North Carolina, 7; North Dakota, 2; Ohio, 5; Oklahoma, 1; Oregon, 4; Pennsylvania, 4; Rhode Island, 2; South Carolina, 2; South Dakota, 4; Tennessee, 4; Texas, 7; Utah, 1; Vermont, 1; Virginia, 3; Washington, 13 (including repair stations, Wells and Gettysburg); West Virginia, 1; Wisconsin, 3; Wyoming, 2; District of Columbia, 1.

During the year four stations were established and twelve discontinued, as follows:

Observing stations established and discontinued.

Stations.	Date.	Stations.	Date.
ESTABLISHED.		DISCONTINUED—continued.	
Evansville, Ind	June 1, 1894	Escanaba, Mich	June 30, 1894
Gettysburg, Wash.*	Sept. 20, 1893	Kearney, Nebr	Mar. 31, 1894
Wells, Wash.*	Sept. 19, 1893	Keelor, Cal	Do.
Williston, N. Dak	Nov. 21, 1893	Lexington, Ky	Sept. 30, 1893
DISCONTINUED.		Manistee, Mich	Mar. 31, 1893
		Micco, Fla	Nov. 28, 1893
		Montrose, Colo	Oct. 21, 1893
Buford, Fort, N. Dak	Nov. 16, 1893	Red Wing, Minn	Aug. 31, 1893
Cheboygan, Mich	Aug. 31, 1893	Stanton, Fort, N. Mex	Nov. 10, 1893
Clemson College, S. C	do		

* Repair stations only.

The station on the summit of Pikes Peak, together with the substation at Colorado Springs, will be discontinued October 1, 1894.

In the interest of economy and in view of the fact that full stations at the points indicated were no longer essential for the general work of the Bureau, the service at Yankton, S. Dak., Olympia, Wash., and Dubuque, Iowa, was materially reduced and the regular observers (one at $1,000 and two at $1,300 per annum) were replaced by citizens residing in the respective localities, whose compensation is nominal. These gentlemen are known as "station agents" and the system works well enough to encourage the expectation that the same method may be satisfactorily applied elsewhere.

The force at stations varies from 9 at New York and Boston to 1 at about one-third of the stations. The average number is 2. The salary cost of stations varies from $8,036 at New York to $360 in the case of the "station agents." The average cost is $2,060 per station. The number of commissioned employees at stations is 302, with an annual salary account of $321,420. This force is classified as follows: One professor of meteorology at $2,500 per annum (carried on the rolls of the central office, but stationed at Chicago), 28 local forecast officials at $1,500 each per annum, 15 observers at $1,400, 23 at $1,300, 33 at $1,200, 58 at $1,100, 61 at $1,000, 45 at $840, 23 observers and telegraph operators at $720, 4 observers at $600, 1 commissioned messenger at $600, 1 commissioned messenger at $480, 4 station agents at $360, and 1 repair man at $600, 2 at $480, and one at $360.

There are also included 72 noncommissioned messengers, special helps, etc., at salaries ranging from $180 upward.

During the year 31 persons were separated from the observing force (by discharge, resignation, etc.), and 17 added; a net loss to the service of 14 employees. This loss, while causing embarrassment to the Bureau in its effort to maintain a high standard of efficiency, and necessarily entailing extra labor upon the remaining force, has been fairly well met by a careful distribution of the field employees. A recent ruling of the Civil Service Commission which permits unclassified messengers to take observations ("as occasion requires, provided such work is in addition to, and not in lieu of, their legitimate duties as messengers") has somewhat relieved the demand upon the observing force. Under such ruling it not only becomes practicable at times to meet urgent cases (sickness, etc.), without extra expense, but also, under great pressure, to reduce the force at certain points in order to increase it at

others. At the present writing, however, the service has about reached the point where further vacancies must be filled by application to the Civil Service Commission. At most stations the hours of duty are necessarily long, the work exacting in the extreme, and constantly increasing; and it should be pointed out that, while the present station force is barely sufficient to perform the duties required of it, the necessity for employing outside help in cases of emergency has frequently occurred. Further, many requests for merited leave of absence have been denied, owing to the inability of this office to provide for the performance of the applicants' duties. This has worked some hardship to employees, particularly to those serving at one-man stations, and stations located at isolated points, or where the climatic conditions are especially trying. Under existing circumstances, except in rare cases where adjacent stations may be drawn upon temporarily, or where the health of an efficient employee may be at stake, leave of absence must be granted at the expense of the applicant.

INSPECTORS.

The three inspectors of the Bureau, while actually stationed in the field (at Detroit, Nashville, and San Francisco, respectively) are not included in the foregoing enumeration, as they were borne on the rolls of the central office during this fiscal year. Provision was made in the appropriation act for the fiscal year ending June 30, 1895, for the transfer of the salaries of the inspectors to the station expense roll.

While recognizing the importance to the service of the inspection of stations, upon which a successful administration of station affairs largely depends, for economic reasons it was not deemed proper to continue the practice of former years by frequently inspecting all the stations in the field. A limited number were selected and inspected.

Carrying out the directions of the Secretary of Agriculture, on January 4 instructions were issued creating three inspection districts: The northern, including the New England States, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Missouri, Kansas, Colorado, and northward and west to the continental divide, with headquarters at Detroit; the southern, including the remaining States east of the divide, with headquarters at Nashville, and the western, including all States and Territories west of the divide, and Arizona, with headquarters at San Francisco.

The inspectors are now required to render monthly reports containing recommendations, suggestions, etc., for the improvement of the service in their respective districts. These reports are based upon personal visits and correspondence.

FORCE AT CENTRAL OFFICE.

The reorganization of the central office was completed during the year, and the work distributed among the following-named divisions and sections:

	Number.
Accounts (including acting assistant district officer, carried on rolls of Department proper)	7
Agricultural soils	3
Forecast (including official in charge, detailed from Army)	30
Publications	32
Records and meteorological data	18
State weather service	6

	Number.
Supplies (including 1 clerk detailed from the Department)	8
Captain of the watch	44
Chief clerk's office	6
Instrument room	7
Library	3
Miscellaneous (including 3 inspectors, 1 clerk detailed from the Department, and 1 clerk assigned to the Civil Service Commission)	10
	174
Chief of Bureau	1
Total	175

The number of employees under the captain of the watch is large, but it includes not only the messengers, laborers, and charwomen usual to a public office, but also the messengers needed for the prompt delivery of the weather maps to subscribers and to the mails.

During the year 58 persons, whose salaries aggregated about $54,750 per annum, were separated from the office rolls, and 45, whose salaries aggregated about $36,770, were added thereto, being a difference of 13 persons and $17,980.

The total number of persons borne on the rolls of the central office on June 30, 1894, was 171, representing salaries aggregating about $178,731.60 per annum.

The force on duty in the division of agricultural soils, while carried on the rolls of this Bureau, are located in the Department proper, under the immediate supervision of the Assistant Secretary of Agriculture.

The system of keeping a "daily record" of each employee of the central office has been continued. The record consists of a statement of the employee's attendance, punctuality, deportment, and efficiency. Primarily the ratings are given by the chiefs of division. In order to insure absolute fairness to each employee a "board on ratings" has been appointed to consider and pass upon all questions relative to these matters. The board meets at the close of each month and revises the efficiency ratings as given by the division chiefs.

The average number of days annual leave granted employees of the Bureau during the year was: Field force, 15¼; office force, 25¾. The average number of days lost by sickness was: Field, 4⅕; office, 4½.

FIRE AT THE CENTRAL OFFICE.

On June 27, about 4 a. m., fire was discovered in the annex, in that portion used for the storage of supplies, etc. The prompt response of the fire department prevented serious loss. After careful examination the total loss, including cost of repairs, was estimated at $2,259.71.

As an extra precaution against further loss by fire, and to add to the safety of the premises generally in the absence of the day force, a number of watch-call boxes have been located at selected points throughout the main building and annex. The night watchman is required to visit each box once every hour during his tour of duty, and, by means of an electrical contact, register on a clock dial in the main building the hour of his inspection of each point. The captain of the watch is required to visit the buildings at stated intervals outside the ordinary hours of business.

FORECASTS.

The regular forecasts of weather, wind, and temperature have been made from the 8 a. m. and 8 p. m. observations, and furnished to the press associations, telegraph companies, and newspapers.

Forecasts have been made for forty-five separate districts, covering

the entire country east of the Rocky Mountains. The forecasts are made for periods of twenty-four to thirty-six hours, respectively, and for longer periods when the conditions warrant.

Storm warnings have been telegraphed to the lake and seacoast stations, and to the director of the Canadian meteorological service at Toronto; warnings of frost to fruit, cranberry, tobacco, and cotton regions, and warnings of severe local storms, cyclones, cold waves, northers, and dangerous floods to the threatened districts, have also been issued whenever the conditions justified them.

The storm warnings issued during the year have, as a rule, received wide distribution, and very rarely has a storm passed without sufficient warning having been given those in danger; notably was this the case in the severe cyclones of August 25 to 27, and October 12 to 14, 1893.

STORM OF AUGUST, 1893.

The presence of the August storm near the Crooked Islands was indicated in the reports of August 25, two days before the effect was felt on the coast of the United States, and on the afternoon of that date northeast signals were hoisted at Savannah, Charleston, and Wilmington, and the secretaries of the New York and Philadelphia maritime exchanges and the observers stationed on the Florida coast notified of the approach of the storm. By the morning of the 26th the vortex of the storm had advanced to the vicinity of the Bahamas, and the forecasts of that morning announced that the track of the hurricane was approaching Florida and would probably keep to the west of the two preceding tracks and bring more rain to the interior of the Atlantic Coast States. On the afternoon of the 26th a bulletin was issued to the press giving the course of the storm; at 9.30 a. m. northeast storm signals were ordered for the Florida coast, and dispatches sent to the display men at Sandy Hook and Long Branch, stating that unusually high tides were indicated along the Middle Atlantic and South New England coasts for the night of the 26th, and the secretaries of the maritime exchanges at New York and Philadelphia, and observers at Delaware Breakwater, Baltimore, Norfolk, Boston, New York, and Philadelphia were informed that the storm existing off the coast rendered it unsafe for vessels to leave for the South until further notice, etc. At 3 p. m. northeast signals were ordered for the stations on the North Carolina and Virginia coasts.

The morning of the 27th the storm center was about due east of Titusville, Fla., the barometer at that station reading 29.34. On the evening of the 27th the center reached the Georgia coast, and by the morning of the 28th had advanced to Augusta, Ga., where devastation marked its advance through the South Atlantic States. The special reports from the stations, about 1 p. m. Sunday, the 29th, showed that the storm was of such intensity that the Secretary of Agriculture, who was visiting the office, decided to send a special warning to the President, informing him that the storm would reach the middle Atlantic coast Monday and the New England coast Monday night, and that shipping had been warned that it was unsafe to leave port.

At noon of the 28th southeast signals were hoisted from Sandy Hook to Boston, and northeast storm signals on lakes Erie and Ontario. In the afternoon the observers in New Jersey, New York, Connecticut, and Philadelphia were wired that severe easterly gales, heavy rains, and unusual tides were indicated for the Atlantic and New England coasts Monday night. They were also instructed to give the information to the public through the press and telegraph it to the postmasters in

their vicinity. Telegrams were sent to the postmasters at Cape May, Asbury Park, Sea Isle City, Wildwood, Beach Haven, and Barnegat city giving similar information, with the request that it be given to the public. The secretaries of the maritime exchanges and officials of the Baltimore and Ohio and Pennsylvania railroads were also notified.

The evening reports of the 28th showed the storm central over western Virginia; at 8 a. m. of the 29th it occupied central New York, and by that evening had reached northern Maine. It will thus be seen that the dangerous character of the storm was recognized by the Bureau on the 25th, and that its advance was announced ahead at every point, by warnings, from twenty-four to thirty-six hours before its arrival. Many letters on file in this office show that the work of the Bureau in connection with this storm was of marked public benefit.

STORM OF OCTOBER, 1893.

The approach of the West India cyclone of October 12 and 14, as announced in the afternoon synopses of the 9th, and signals ordered for Jupiter and Key West, Fla., at 8 a. m. of the 10th, followed by signals on the Florida coast at 8 p. m. of that date, at which time it was stated that the cyclone was approaching the Florida coast. At 8 a. m. of the 12th the cyclone had advanced to the Florida coast, between Jacksonville and Jupiter. Its subsequent path through the interior and along the coast was accurately forecasted, and due notice sent to all interested, until it reached the St. Lawrence Valley.

Great assistance was given the forecast officials by reports from the West India stations at St. Thomas and Santiago de Cuba, received as early as the 5th and 6th, and from Port au Prince on the 8th, as well as the reports of heavy sea swell received from the Life-Saving Service stations and our observers on the coast, the observer at Southport reporting on October 11: "Heavy sea swell from the southeast, accompanied by low roaring noise, weather hazy, low cirrus from the south."

In view of the importance of an early warning of hurricanes arrangements have been perfected by which the Light-House Board and Superintendent of the Life-Saving Service have instructed the keepers of houses and stations on the Atlantic and Gulf coasts to telegraph this Bureau from July to October each year, whenever the heavy ocean swells or other signs observed by them denote the approach of hurricanes to our coast, these keepers being exceptionally well located for the purpose.

VALUE OF WARNINGS.

Frequent calls for estimates of the value of the work of the Bureau, which have reached me during the last year, have directed my attention especially to this subject. No estimate can be put on the current work of the Bureau, for it affects innumerable interests and varies from day to day in the influence it has on each. In the case of warnings of special storms, cold waves, frosts, and similar phenomena, an estimate can sometimes be made. Perhaps the most reliable are the two which follow, each being made by the director of the State weather service for his own State. The director of the Ohio service, in his annual report, says:

General satisfaction has been expressed by those interested in the work relative to cold-wave warnings; especially was this so during the cold periods of January and February, when the cost of the service at this point during the entire year was more than saved, during any one of these warnings, by the benefits to the commis-

sion men of this city alone. An ice dealer attributed the cutting of 1,500 tons of ice, which otherwise he would have lost, to knowledge derived of an incoming cold wave. The benefits derived have been varied and valuable and are hard to estimate, but would say at least $200,000 would be a low estimate, judging from a few of the following reports received, as to the warning of January 24, 1894. (Reports referred to are omitted.)

The director of the North Carolina service, in his annual report, says:

It is estimated that during the season $200,000 worth of produce was saved from frost, chiefly potatoes and strawberries.

These estimates are conservative and indicate that for the whole United States, and for one season, the cold wave and frost warnings alone resulted in a visible saving to the public which can be put at many times the total annual cost of the Bureau.

FORECAST STUDIES.

The forecast officials not employed in preparing the daily forecasts for publication are required to make practice forecasts each day from the forenoon reports, employing the remainder of the time in the investigation and preparation of reports upon useful meteorological problems that have been officially assigned them. Among the subjects treated this fiscal year may be mentioned:

Dependence of water level changes, in the St. Marys Falls Canal, upon certain atmospheric changes.
A study of storms in Texas.
Study of high areas on North Pacific coast (effect on weather of Missouri and Upper Mississippi valleys).
Report on September low-pressure areas appearing north of Idaho and Montana.
Report on cold waves on the middle Gulf coasts.
Report on the areas of high barometer appearing north of St. Lawrence Valley.
Report on September West India storms.
Study of barometric troughs.
Types of storms in the United States in June.

The study of the relations of terrestrial magnetism to meteorology has been continued.

There has also been prepared by the chief clerk in the division a paper on the "Protection of fruits, vegetables, and other food products from injury by heat or cold during transportation," which contains a table showing the lowest and highest temperatures to which most of the articles may be subjected without injury. Two thousand copies of this valuable paper have been ordered printed for distribution.

Two of the forecast officials at Washington are charged also with other duties, one being editor of the Monthly Weather Review, the other chief of the instrument room. They are thus loaded with double duties. In the latter case especially the best interests of the Bureau would be subserved by permitting this officer to give his entire time to the instrumental outfit of the service and its improvement.

LOCAL FORECAST OFFICIALS.

The appointment of this class of officials was provided for by Congress in 1891, twenty being the number of observers who were to be thus designated. This number was increased to twenty-six in 1892, and in 1893 a total of thirty was allowed.

These officials were assigned to certain of the larger cities and authorized to make and publish forenoon and afternoon forecasts for such territory as might be assigned them. After quite a trial, the forecasts made by these officials, except in special cases, were restricted to fore-

noon predictions, the afternoon forecasts being made at Washington and telegraphed to the various centers for distribution.

An examination of the forecasts made by these officials for the past six months shows the highest general average to have been 84.4 per cent and the lowest 72 per cent. The work of forecasting for the Pacific Coast region has been done exclusively by the local forecast officials stationed at San Francisco, Cal., and Portland, Oreg., respectively.

During October, November, and December, 1893, six of the local forecast officials were given a two-months' course of instruction at the office in the preparation of charts and making practice forecasts, most of the other officials having previously taken this course. There are still a few, recently appointed, who have not had the advantage of this valuable training.

On June 1, 1894, a professor of the Bureau was stationed at Chicago and given the States of Wisconsin, Illinois, and northwestern Indiana to forecast for. The ordering of wind signals for lakes Pepin, Superior, Michigan, and Huron was also assigned to him exclusively.

This arrangement has already resulted in the increase of the value of this important service on the lakes.

WIND SIGNALS.

Twenty-seven new stations for the display of wind signals were established during the year, sixteen being on the Great Lakes, and at points where their value to the shipping interests were fully attested by those interested in the marine work. The demand was so urgent for an increase in this class of stations that at eight of those established the display men agreed to perform the duties without expense to the Bureau, except for the equipment. Six stations were discontinued at points where it was found after careful examination that the funds expended in maintaining them would be used to better advantage at more important points. The total number of stations now in operation on the Atlantic, Gulf, and Pacific coasts and the Great Lakes is 119. It is gratifying to state that, while the total increase in the stations is twenty over that of the previous year, this large addition has been made at an additional expense of only $446.

Action has been taken to secure a list showing the places at the various regular and substations on the lakes at which the warning messages will be posted, and it is proposed to have the list printed on a card and distribute them to the captains of vessels, so that hereafter the vessel master, when he sees the signals flying, can, by visiting one of the points where the messages are posted, acquaint himself as to the movement of the storm, etc. On the Atlantic, Gulf, and Pacific coasts display men have been directed to post copies of the messages at several places in each town where the mariners usually congregate, and to have copies of the message published in the papers. A bulletin board containing a description of the signals will be sent to the stations to be used in displaying a copy of the warning message.

STEAMSHIP RAPPAHANNOCK.

As an evidence of the value of the warning messages sent to the coast stations, I will mention the saving of the stranded steamship *Rappahannock* through the instrumentality of our observer at Cape Henry, in January, 1894.

The vessel went ashore off Cape Henry at 7 p. m. of January 22, and immediately the observer telegraphed the fact to the wrecking com-

pany at Norfolk, Va., and the company at once sent a vessel to the steamer, and began unloading, but found that they could not lighten her up enough to float on high tide of the night of the 23d.

On the 24th this office notified the observer to "hoist southwest signals at 2 p. m. wind will shift to the southwest and then northwest, with cold wave winds probably dangerous off coast Thursday morning." This information the observer at once communicated to the *Rappahannock* by flag signals, and the warning caused the wrecking company to use every means in their power to discharge sufficient cargo to enable the vessel to float that night, and at 10.35 p. m. she was floated, while at 12.45 a. m. of the 25th, just two hours and ten minutes after the vessel was out of danger, an unusually severe westerly to northerly gale with freezing temperature, rain, and a heavy sea set in; and it is generally conceded that had the vessel continued ashore until the arrival of the gale she would have been pounded to pieces and the vessel and cargo, valued at $600,000, would have been a total loss.

RIVER SERVICE.

In accordance with the announcement in my last annual report, the river service has been reorganized. In September, 1893, a system of sixteen river districts was established, the local forecast officials and observers in charge making the river forecasts for their respective districts. These centers have been increased throughout the year, and we now have twenty-one points from which river information is disseminated.

In ten of these districts daily forecasts of river stages are published on the maps and bulletins and furnished the press, but only telegraphed in cases of marked rises or dangerous floods.

In eleven of the districts only warnings of anticipated marked rises or dangerous floods in the rivers are issued. The warnings are published on the maps and bulletins furnished the press and telegraphed to authorized points.

In selecting these district centers for this important work, their location and general adaptability for distributing the information was carefully considered, and while it has been fully demonstrated that the work can be thoroughly performed, the saving in telegraphic expense has been considerable.

A practical test of the value of the information furnished the public through these river forecast stations was illustrated in the flood which occurred at Portland, Oreg., and Harrisburg, Pa., during the past season.

During what is known as the June flood of the Columbia and its tributary rivers forecasts were furnished the public and the press by telephone and telegraph. From May 21 the notice of approaching high waters and about the rate of the rise per day was given out, and by this means merchants and others were enabled to raise their goods from one story to another of their buildings and thus escape danger.

From letters and reports received, from the merchants and others interested in Portland, the official at that station estimates that the warnings issued by the Bureau were the means of saving, in that city alone, $240,500, as shown by the correspondence on file in this office.

The flood in the Susquehanna River occurred on May 21 and 22. Warnings of danger apprehended were sent out from the Harrisburg station on Sunday, the 20th, to every point on the river that could be reached that day, many of the telegraph offices being closed and lines

being in trouble on account of bad washouts from the heavy rains. This flood resulted in flooded cellars in Harrisburg, the entire destruction of all truck crops on the islands in the river, and some damage to the railroads. From reports received by the observer it is estimated that the timely warnings given resulted in saving between $60,000 and $70,000 worth of property, principally perishable mill property of the Pennsylvania Steel Works and the Central Iron Works, and furniture in the flooded districts.

RAINFALL STATIONS.

These stations are located at suitable points on the watersheds at the sources and on the principal tributaries of the rivers. The reports of rainfall are used in connection with those received from the river stations as an aid to the forecaster in his work. By a careful rearrangement of these stations it has been possible to considerably reduce the number, without in any way impairing the usefulness of the work. These stations take an observation once daily, when the rain occurs, and mail the report to the center at the end of each month. Each station also telegraphs the rainfall to the center when it amounts to 1 inch or more in twenty-four hours.

WEST INDIES CYCLONE SERVICE.

This service was in operation from July 15 to October 15, and reports rendered by telegraph and mail from Santiago, San Domingo, St. Thomas, and Kingston, at each of which points this Bureau has paid observers. The San Domingo station was discontinued in March, 1894, as it was believed that the work could be equally as well carried on with reports from the remaining three, and its maintenance would be an unnecessary expense. During the hurricane season observations are taken twice daily and telegraphed to our observer at Key West whenever an unusual meteorological disturbance occurs or information is received of an approaching storm. During the interim of the hurricane season observations are also telegraphed in cases of approaching hurricanes. Voluntary telegraphic reports are also received by our observers at Jupiter and Key West, respectively, and when of interest telegraphed to this office, from Nassau, New Providence, Bahama Islands, and Havana, Cuba, through the cooperation of the governor of the Bahama Islands and superintendent of the central office of the Meteorological Marine Service of the Antilles at Havana. Action has also been taken by personal interview and correspondence to secure the voluntary cooperation of Rev. Lorenzo Gangoite, S. J., of Belen College, Havana, and members of the Jesuit Order in Balize, Yucatan, in rendering reports of hurricanes, etc., to the Bureau. The Bureau is greatly indebted to Rev. J. T. Hedrick, S. J., of Georgetown College, Washington, D. C., for his kind offices in this connection.

LAKE MARINE SERVICE.

The duties of the official in charge of this service, who is also an inspector in the Bureau, consists in the distribution of bottles containing a paper addressed to this Bureau, to vessel captains on the lakes, who drop them overboard, noting thereon the square, as shown on a chart furnished for the purpose. The finder of the bottle opens it, notes date and place, and forwards it to this office. The track covered by the bottle is charted and used to determine the course of the lake

currents. During the season of 1893 and 1894 2,401 bottles were floated and 481 reports were received at this office. The tracks of these bottles were charted and the charts distributed for the information of the lake interests.

This official has charge of the simultaneous observation work carried on by vessel masters on the lakes and the distribution of the thermometers for obtaining the temperature of the water. During the season 1893 48 vessel captains rendered reports to this office, while up to June 30 of this season 83 captains were taking observations and forwarding reports.

The work of the marine service also comprises the collection of data relative to wrecks which occur on the Great Lakes, consisting of the names of the vessels, place, and date of wreck, amount of loss, etc. The officials in charge at Buffalo, Cleveland, Detroit, and Chicago collect these data for certain lake territory assigned them, and the official in charge of the service tabulates the data and prepares a chart showing the location of the wrecks. One such chart has been prepared and issued during the past year, showing the wrecks occurring from December 17, 1885, to November 15, 1893, inclusive.

TELEGRAPH SERVICE.

RELATIONS WITH PRIVATE COMPANIES.

As a whole, the service rendered by the telegraph companies has been very prompt and efficient. The best telegraphic record in the history of the Bureau was made on the morning of April 6, 1894, when all reports due at this office, over circuits and by special message, were received by 9.09 a. m., or fifty-four minutes after the time of filing. Not a single report was missing. When it is remembered that these reports embraced observations taken at 126 stations, scattered over the continent from the British Possessions to the Gulf, and from the Atlantic to the Pacific, and that in addition to their concentration at this office they were at the same time distributed to Weather Bureau stations at numerous other points, the efficiency of the system of circuits and special messages, and the promptness of the observers and operators is apparent.

A reduction of about 15 per cent in the cost of the regular "circuit" business has been effected by revising the contracts for the preceding year. The total expense for telegraphing (May and June estimated) was $146,147.48, or $43,852.52 less than the allotment, and a saving of $12,052.66 by reason of reduced telegraph rates. By a readjustment of the rates for local forecast and cotton-region messages, an additional saving of about $4,000 will result to the Bureau during the current year, besides permitting local forecast officials to add six words to each forecast, without increased expense.

SEACOAST TELEGRAPH LINES.

The completion of a commercial telegraph line from Titusville to Jupiter, Fla., on April 4, 1894, resulted in the abandonment and projected sale of the 130 miles of Government line between those points The line was badly damaged by a cyclone in October of last year, but so much of it as had not already been duplicated by the private line, was restored and maintained in operation for the benefit of the public, until its final abandonment on the date mentioned.

The land lines and cables connecting Thunder Bay and Middle Islands, in Lake Huron, with the city of Alpena, Mich., were completed and put into operation on July 14, 1893. These lines aggregate 31 miles, inclusive of 5½ miles of submarine cable. They are operated with telephones, and serve primarily to transmit storm warnings to the wind-signal display stations on the islands. Incidentally they are also of value in the transmission of marine intelligence and in affording telephonic communication to the life-saving crews. The substantial manner of their construction is evidenced by the fact that communication with Thunder Bay Island was interrupted on only two days during the entire year, and with Middle Island for only a few hours at a time on three days.

On the Nantucket section the only serious interruption occurred between July 24 and August 1, 1893, due to trouble in one of the submarine cables to the mainland. A number of new wooden poles were put up on Marthas Vineyard, and about 400 more will be needed during the current year between Vineyard Haven and Gay Head. Otherwise the line is in good condition. The citizens of Chilmark, Marthas Vineyard, were permitted to attach a telephone to the Government line, to put them in communication with the mainland. On Nantucket Island the line proved of value in connection with the wreck of the schooner *Minnie C. Taylor*, January 13, 1894. There were eleven days when the line was interrupted for twenty-four consecutive hours.

The Block Island section has remained in almost perfect working order; only three minor interruptions, of a few hours duration each, occurred during the entire year.

On the Hatteras section extensive general repairs became necessary during the year, involving the setting of 1,285 new wooden poles and the stringing of 12 miles of new wire. This, together with the reopening of the repair station at Currituck Inlet, North Carolina, in August, 1893, has placed this important section in a high state of efficiency. During the entire year there were twenty-two days when communication between Hatteras and Norfolk was interrupted for twenty-four consecutive hours, eleven of which were due to damage done by a cyclone in August. The great value of this line to maritime interests was exemplified in connection with the stranding of the American steamship *Rappahannock*, already referred to. Among other instances of good service rendered may be mentioned the case of the British schooner *Evolution*, which on March 3, 1894, was helplessly drifting about off False Cape, Virginia, with all sails blown away, and to which, by means of flag signals, the observer at Cape Henry directed the assistance of a tug. On the same morning the four-masted schooner *Fanny Arthur* came ashore at Cape Henry, but was soon pulled off by a steamer, telegraphed for by the observer.

The Wilmington-Southport (North Carolina) line was interrupted but three whole days, and required but few repairs. In view of the fact that its operation requires skilled service at Southport, and that local rather than national interests are served by it, it is thought that the line should be sustained by private enterprise. Steps have, therefore, been taken to dispose of it by sale to the highest bidder.

Of the lines on the Pacific coast, both the Tatoosh Island and Fort Canby sections received substantial general repairs during the year. Owing to the exceedingly rough and densely wooded country over which most of the Tatoosh line is built, and the constant difficulties attending its maintenance and repair, two additional repair stations were estab-

lished last summer, one at Gettysburg and the other at Wells, Wash. This addition to the repair force, together with the selection of a new chief operator, has resulted in a marked improvement in the efficiency of the line. There were thirty-six occasions when communication between the island and Port Angeles was interrupted for twenty-four consecutive hours, an interruption of three days being due to a break in the cable, which had chafed against the rocks near Tatoosh Island.

The Fort Canby section has worked satisfactorily, with only five days of total interruption.

Both of these lines are of such great value to the maritime interests of the north Pacific Coast, independent of their usefulness in conveying meteorological reports, that the cost of their maintenance and operation must be considered insignificant in comparison with the service rendered.

The line between Point Reyes Light and San Francisco, Cal., has also done good work in reporting passing vessels and summoning aid to vessels in distress. All vessels entering San Francisco Harbor make Point Reyes Light first, then change course to enter the heads; hence the value of station and line for reporting purposes. There were nine days when the line was totally down. The work at Point Reyes, especially the meteorological duties, is handicapped, however, by the lack of proper office facilities.

The total mileage of seacoast lines at the end of the year was 515 miles, of which 318 miles were on the Atlantic coast, 166 miles on the Pacific coast, and 31 miles on Lake Huron.

The receipts from commercial messages amounted to $3,923.93; and $4,148.99 was collected on account of connecting commercial lines.

The total expense for ordinary line repairs was $1,004.38; and for general repairs, including cost of new poles and other line materials, repairs to submarine cables, etc., $4,678.38.

THE DISTRIBUTION OF FORECASTS AND FROST, COLD WAVE INLAND STORM, AND RAIN WARNINGS.

The rapid and extensive distribution of forecasts is second in importance only to their making, and much attention is devoted by the Bureau to this subject. Several improvements have been introduced and developed during the year.

In order to give greater scope and extend the benefits of the service to localities not having a regular station, a circular letter was sent to all stations, inviting their attention to the fact that there are, in a number of instances, within a comparatively short distance of our stations, cities and towns where daily evening papers are published, and that while these papers at present, as a rule, publish simply the forecasts as furnished by the press associations, it was believed that in many cases the editors would be willing to publish a brief synopsis and table, and perhaps a local report of the nearest Weather Bureau station, if furnished them by mail. The reports from the several stations as to the success of this action are most flattering, and will result in a much wider distribution of the climatological and other data than has ever been attained, and also give to the public in these localities full information as to the progress of the various storms through the synopsis furnished.

The Honorable Postmaster-General has also signified his willingness to cooperate with the Bureau in having the postmasters throughout the threatened district distribute warnings of the approaching hurricane to those whose interests are likely to be affected, and has published

a circular in the August supplement of the United States Postal Guide. It is proposed, therefore, to telegraph warnings of these storms to a selected number of postmasters in the locality, or probable path of the storm, and by this means have the information circulated over a wider area than has heretofore been possible. It is thought that this arrangement will prove of great value as a partial protection from these destructive storms.

Probably the most effective method of increased distribution lately devised is that now used by the State weather service division, whereby the person who receives the forecast by telegraph becomes the center for further distribution. Through the voluntary aid of these persons the messages are printed upon franked postal cards and mailed from distributing centers to as many points as can be reached in time to make the information of value to the public. This is done by means of an outfit consisting of rubber logotypes, type holder, ink pad, and franked postal cards containing the addresses of the places to be supplied with the forecast messages, which can be quickly and easily printed upon the postal cards for distribution by mail.

An increase of nearly 2,000 in the past six months in the number of places receiving forecasts or special warnings for the use and benefit of the general public has been made, over 1,800 of which receive the daily forecasts without expense to the Weather Bureau. The simple and inexpensive method of mail distribution, by means of logotypes and postal cards just referred to, has been devised, and by this plan alone over 4,000 points were receiving the forecasts at the close of the year. This number is rapidly growing and the prospects are favorable for its reaching 10,000 during the coming year. A large number of railroad companies are allowing the use of their wires for the daily transmission of the forecasts, and require their agents to receive the same and post the information for the benefit of the traveling public. An increase has also been made in the number of stations receiving forecasts by railway train service, by which means the daily forecasts are distributed through the train baggage men to station agents for bulletin purposes. The total number of stations of record now receiving forecasts and special warnings by paid service and through gratuitous distribution is 11,232. There is a growing demand for the forecasts on the part of the agricultural classes, and the efforts of the Bureau to give them early and accurate weather information is greatly appreciated, as numerous commendatory letters which have been received will indicate.

Nearly five hundred full sets (of five) and over one hundred partial sets of weather signal flags have been supplied by the Weather Bureau during the year.

The following tabulated statement will be of interest as showing the number of places supplied with forecasts through the various modes of distribution; the same being arranged with a view to comparison of the work of distribution in each State and Territory:

Distribution of forecasts, cold wave, and frost warnings.

States and Territories.	By telegraph or telephone at Government expense—			Without expense to the United States by—			
	Forecasts and warnings.	Cold wave warnings only.	Frost warnings only.	Mail.	Telephone or telegraph.	Railroad telegraph.	Railroad train service.
Alabama	23	0	0	206	1	17	49
Arizona	1	0	0	0	0	0	0
Arkansas	30	1	3	62	19	3	0
California	62	0	4	33	37	26	0
Colorado	16	5	7	13	0	4	7
Connecticut	10	3	4	60	49	12	156
Delaware	11	0	0	0	0	18	0
District of Columbia	1	0	0	0	7	0	0
Florida	19	1	18	139	10	14	0
Georgia	45	1	39	93	1	109	68
Idaho	1	0	0	0	0	0	0
Illinois	86	11	6	139	8	150	0
Indiana	85	4	0	234	0	57	106
Indian Territory	6	0	0	0	1	0	0
Iowa	86	11	0	179	4	0	0
Kansas	54	3	0	178	23	91	0
Kentucky	42	6	42	226	4	0	0
Louisiana	29	4	24	36	15	4	0
Maine	31	3	1	89	7	6	77
Maryland	21	1	3	47	4	87	0
Massachusetts	15	5	16	87	16	0	331
Michigan	67	9	0	97	14	211	5
Minnesota	57	2	13	25	5	0	0
Mississippi	34	5	10	26	28	57	0
Missouri	69	6	1	418	57	0	60
Montana	6	0	0	0	1	0	0
Nebraska	58	4	0	75	1	11	0
Nevada	2	0	0	0	0	0	0
New Hampshire	21	1	0	112	0	2	29
New Jersey	29	5	22	104	18	151	0
New Mexico	0	0	0	0	0	0	0
New York	108	20	12	291	155	230	161
North Carolina	65	2	22	252	12	0	16
North Dakota	21	3	12	0	0	0	0
Ohio	95	4	90	413	81	53	0
Oklahoma	10	1	0	0	0	0	0
Oregon	28	0	0	4	0	0	107
Pennsylvania	78	15	2	108	286	747	7
Rhode Island	6	1	0	0	0	0	26
South Carolina	49	6	1	57	11	33	0
South Dakota	47	6	13	39	1	0	0
Tennessee	22	2	24	50	22	16	90
Texas	41	3	13	259	29	3	0
Utah	0	0	0	0	7	10	0
Vermont	14	0	0	105	1	11	4
Virginia	27	3	10	8	1	49	96
Washington	23	0	3	27	0	0	30
West Virginia	17	1	11	38	4	37	0
Wisconsin	110	0	16	35	7	0	0
Wyoming	0	3	6	0	0	0	0
Total	1,778	161	448	4,361	947	2,219	1,318
Grand total							11,232

STATE WEATHER SERVICES.

WEATHER CROP SERVICE.

This feature of the Bureau's work has been materially improved during the year. At the beginning of the crop season of 1894 a plan was put into operation by which the temperature and rainfall observations at the cotton-region stations of the Bureau have been used in the preparation of the meteorological charts. The additional data thus secured renders it possible to construct the charts with greater accuracy than heretofore, as the number of States whose reports are utilized has been nearly doubled.

A change in the form of the National Bulletin was also made, with the issue of May 14, 1894, by which two charts were added, one showing the actual rainfall and the other lines of highest and lowest temperatures. These added features have contributed greatly to the popularity of this already highly valued publication, the demand for which is continually growing. Several of the leading agricultural journals of the country now reproduce in their columns the full text of the Bulletin with the accompanying charts, while the circulation through the regular daily, weekly, and semiweekly press is beyond computation.

For some time past the growing demand for the National Weather Crop Bulletin has clearly indicated the necessity for a western edition, and during June arrangements were completed for the issue of the bulletin in an abridged form in Chicago. The first number of the Chicago bulletin was issued July 3, 1894, and although the original edition is as yet limited, its circulation through the press is widespread. More than 1,000 weeklies of the Chicago Newspaper Union immediately began its publication, while a number of agricultural journals which formerly could not be reached in time with the bulletin are now being supplied and gladly publish the information. All State service organizations publish weekly weather crop bulletins for their respective States, and the edition of these has been largely increased during the year, the Ohio service issuing nearly 30,000 copies weekly. The Weather Crop Bulletin of the Texas service attains a circulation of 125,000 weekly through the press of the State.

COTTON-REGION SERVICE.

There are 118 cotton-region stations located in the principal cotton-producing States, at which daily observations of temperature and rainfall are taken during the period from the middle of April to the end of November. These stations are grouped under 12 district centers, at which telegraphic reports of temperature and rainfall are collected daily, and from which bulletins are prepared and published for the benefit of the cotton interests. This branch of the Bureau's work has received much attention during the year, an inspection of the stations having been made by the officials in charge of the respective centers prior to the beginning of the season, for the purpose of securing the best possible exposure of instruments, and giving observers thorough instruction as to their duties. This inspection of more than 100 stations, involving journeys aggregating about 8,000 miles, was made with great economy, costing the Bureau less than $500. The marked improvement in the character of the work at these stations, as a result of the inspection, shows that the expenditure was well made.

Two new cotton-region stations were established during the year, one at Yazoo City, Miss., and one at San Marcos, Tex. Additional stations, especially in Texas, would prove of advantage to the Bureau and to the interests for which these stations are maintained.

SNOW CHARTS.

This publication, which was begun in January, 1893, was resumed December 4, 1893, and continued until March 26, 1894. It has proved valuable and interesting as showing the extent of country covered with snow and the depth on the ground at 8 p. m. on Monday of each week. It is believed that this chart would prove of greater value if published at shorter intervals. Upon the resumption of this publication in December, 1893, in addition to giving a tabular statement of the depth of snow

at the several Weather Bureau stations, the thickness of ice in rivers and harbors as reported from Weather Bureau stations was added. The information contained in these charts would be made of greater value by securing reports from a more extensive system of stations, the cost of which would be slight.

During February and March efforts were made to establish at high altitudes in the mountain regions west of the Mississippi stations for recording the amount of snow fall and the accumulated depths in these regions during the winter months, with a view to utilizing the data collected for the benefit of the agriculturists in arid regions whose water supply depends upon snow fall upon adjacent mountain ranges. About 50 such stations were established, and had the Bureau been prepared to supply the necessary snow gauges a large number of additional stations might have been equipped.

STATE WEATHER SERVICE CONVENTION.

The third annual convention of the American Association of State Weather Services met in Brooklyn, N. Y., August 17, 1894, in conjunction with the American Association for the Advancement of Science. The State Weather Service Association was organized in 1892. In that year its meeting was held in Rochester, N. Y., and in 1893 it met in Chicago. These meetings of the directors of State weather services are for the purpose of discussing the subjects of interest to State weather services, methods of work, etc., with a view to extending and improving the work of these services and increasing their value. The Brooklyn meeting was a very successful one, and it is hoped that, as in the two preceding years, its proceedings may be published by the Bureau.

THE METEOROLOGICAL RECORDS.

RECORDS RECEIVED AND EXAMINED.

The division of records and meteorological data has received and disposed of during the year about two hundred and fifty thousand meteorological reports, instrumental record sheets, etc. Such of them as are used in the current work of the Bureau and afterwards filed for future reference and study have been examined for incorrect and improbable entries; the reduction of meteorological observations has been verified when necessary, and the persons making the reports have been advised of all corrections and changes that have been made. Some fifteen thousand meteorological registers have also been received from voluntary (unpaid) observers and similarly examined.

Special forms and instructions have been prepared from time to time to enable observers to tabulate the numerical values of self-recording rain gauges and sunshine recorders, thus completing the series of hourly reports of automatic registers inaugurated in 1889.

The accuracy of observers in taking meteorological observations, reducing, and translating them into telegraphic cipher has been thoroughly tested during the year and is found to be quite as high as at previous periods in the history of the meteorological service.

CONSULTATION OF RECORDS BY THE PUBLIC.

The data files of this Bureau have been consulted, in person and through correspondence, by several thousand persons during the year.

The following letters, taken at random from a number of others, illustrate, in a measure, some of the different uses made of the climatological records of the Bureau:

UNION BRIDGE COMPANY,
Buffalo, N. Y., December 11, 1893.

MARK W. HARRINGTON, Esq.,
Chief of Weather Bureau, Washington, D. C.

DEAR SIR: We have your esteemed favor of the 9th, inclosing table of climatic data for San Diego, Cal. This data is just what we desire and comes in very opportunely. Please accept our thanks for the same.

Yours, truly,

UNION BRIDGE CO.
per THORN

(GLENWOOD) PALMER, NEB., *October 30, 1893.*

MARK HARRINGTON, Esq.,
Chief of the Weather Bureau, Washington, D. C.

SIR: Your favor of the 12th instant, inclosing the climatology of Edmonton, Northwest Territory, was duly received. The statistics were much appreciated by the gentleman for whom I sent, as he found by them that the district would not meet his requirements, and he was consequently saved a long and useless journey and considerable expense. Thanking you for your kind attention, I am

Yours, respectfully,

C. T. O. WILLIAMS,
Voluntary Observer.

Certified transcripts of the original records of observations have been made whenever called for, and the records have been taken into the courts, both in Washington and at outlying stations, as occasion demanded.

SPECIAL COMPILATIONS MADE.

In addition to the regular routine of receipt and examination of meteorological reports the compilation of thunderstorm statistics in hand at the close of the last year's report has been completed; the results will be found in the bulletin on the rainfall of the United States about to be printed.

Tables of maximum and extreme wind velocity, for the information of engineers and others interested in structural work, have also been completed during the year.

Some progress has been made in the work of compiling certain temperature data for the western and northern portions of the United States, under instructions from the Assistant Secretary of Agriculture, but much still remains to be done.

The usual statistical tables have been prepared for the Monthly Weather Review, and beginning with January, 1894, additional tables of pressure, temperature, wind, and sunshine data have been added to those already published.

INSTRUMENTS.

The functions of the instrument room pertain to the maintenance of the instrumental equipment of stations. This includes the preparation of complete drawings and detailed specifications required for the purchase of supplies, the inspection, test, and adjustment of all new instruments, their issue to stations, the supervision of their erection, exposure, and operation while on stations, and the monthly inspection of all automatic records, comparative readings, etc., for the purpose of detecting neglect, or improper care, or the defective performance of instruments.

The climatic and meteorological value and significance of the great volume of data annually accumulated by the Bureau depends in a large

degree upon the wise and judicious administration of the functions of the instrument room. Thermometers whose indications are discordant among themselves and whose zero points change in use yield false and untrustworthy records of mean temperatures, and records of precipitation derived from badly exposed gauges are misleading and of little value. Barometers which, side by side, indicate different atmospheric pressures, when issued to stations give rise to telegraphic weather reports that may quite mislead the forecaster in the drawings of his isobarometric lines, and cause his map of "high" and "low" to be quite in error.

In the execution of its duties during the past fiscal year the instrument room has handled over 1,800 "letters received," has prepared and mailed 1,149 "letters sent," and has inspected and examined nearly 65,000 record sheets and forms from automatic instruments in operation at stations.

Nearly 700 new thermometers of all kinds were inspected and compared with standards.

Anemometers, barometers, registers, and such instruments in operation at stations, deteriorate with use and require to be replaced. When returned to instrument room they are more or less defective and require repairs, which, in part, are effected by contract with regular manufacturers, but are also largely made in the machine shop. Owing, however, to the very simple and limited equipment (two small foot lathes and bench tools, with two mechanicians), the kind of work is limited to that of the simplest character, and progress is generally slow.

The following table exhibits the number of the more important instruments received and issued during the year ending June 30, 1894:

Instruments received and issued during the year ending June 30, 1894.

Name of instrument.	Purchased from manufacturers.	Received from stations.	Issued to stations.
Anemometers	* 96	132	114
Barometers	1	61	32
Barographs	10	8	10
Gauges, rain (float)	None.	12	9
Gauges, rain and snow (weighing)	10	None.	9
Hydrometers	None.	3	183
Psychrometers, sling	10	3	4
Registers, single	None.	34	28
Registers, double	None.	6	2
Registers, triple	3	11	15
Supports, wind instrument	5	3	13
Sunshine recorders	None.	12	38
Telo-thermographs	None.	5	7
Thermographs	10	39	40
Thermometers (all kinds)	686	† 894	938
Water thermometer cases	None.	12	30

* Repaired. † 691 of these were received broken, or for repairs.

AUTOMATIC REGISTERING INSTRUMENTS.

The subappropriation allotted for the purchase and repair of instruments for the fiscal year ending June 30, 1894, amounted to $10,700. Of this sum only $7,074 were expended, resulting in a saving of about 34 per cent. This was partly accomplished by increasing slightly the amount of repair work done in the machine shop. The greater part of the saving, however, was effected by the suspension, in a large degree, of the policy inaugurated a few years since of improving the equipment of stations by the addition of automatic recording instruments. The

growth and the utility of the service demand the most improved appliances. Eye observations at 8 a. m. and 8 p. m. are wholly inadequate either for the study of climate or for many of the needs of communities. Commercial, engineering, and agricultural interests require the whole history of all changing weather conditions throughout the entire period of the day, and even the courts in the execution of laws appeal in frequent cases to the records of the Bureau for trustworthy testimony in regard to the minutest details of the weather at any hour night or day. As the public and the specialists become more and more familiar with weather reports and weather conditions, they also become more exacting, not only as regards the kind and quantity of information furnished, but as regards its critical accuracy as well.

The Bureau desires to meet such demands and for several years past has been gradually improving the equipment of stations by the wider and wider distribution of automatic instruments. As a rule such mechanisms are durable to an indefinite extent, so that when stations are once supplied there need be but little expense, except for slight repairs and a few instruments occasionally to replace those accidentally destroyed by fire, storm, lightning, etc.

The equipment of the more important stations of the Bureau is now in an advanced condition, and, without unreasonable expenditures the policy of thus increasing the benefit derived from station work can, in the course of a few more years, be carried to a condition of practical completeness. About sixty-eight stations in the larger and more important cities are now more or less completely equipped. Of the fifty-six that remain not more than ten are located in cities or districts whose interests justify the issue of additional instruments, at the present. If three new stations were supplied each year with instruments, the equipment of the entire service would be practically completed during the next three years. This, however, refers only to the total number of stations that will require improved appliances. Those now operating instruments are not all completely equipped. Many still require automatic rain gauges, and a less number require sunshine recorders.

The entire equipment of the service would be completed by the addition of 70 recording rain gauges, 40 sunshine recorders, 15 triple registers, and 5 each of barographs and thermographs. It is recommended that a portion of these instruments be supplied each year; the greatest need being for recording rain gauges.

PUBLICATIONS DIVISION.

This division is rendered necessary by the urgent character of a large proportion of our publications, and changes and improvements are constantly made with reference to the issuance of our daily weather maps and weather crop bulletins, etc., with the smallest possible delay. The work of the year has been of larger volume than heretofore, but it has been handled with accuracy and dispatch.

SUPPLIES.

The division charged with the control of the supplies for the work of the Bureau has undergone a substantial reduction of clerical force without apparent detriment to its efficiency. The supplies for the past year were less in volume than usual, and less in price. This reduction continues for the present year. To illustrate: Our contract for "map, Form D", for the year ending June 30, 1893, was $3.60 per 1,000; for the year ending June 30, 1894, was $2.90 per 1,000; and for the current

year $1.92 per 1,000, showing, on a contract for 3,000,000, a saving over last fiscal year of $2,940, and a saving over year ending June 30, 1893, of $5,040 on this one item alone. A similar showing can be made in the items of "flags" and "wrappers." All other contracts made for the current fiscal year are at prices far beneath those for the preceding one.

In making your calculations on estimates for the fiscal year ending June 30, 1896, allow me to suggest the possibility that we will not be able to again purchase our supplies on such favorable terms for the Bureau. If the hope indulged by the country at large is to be gratified by a substantial revival of general business, prices must necessarily advance.

While it is the policy of the Bureau to obtain its supplies at the cheapest rate possible, there is one line in which other considerations are of great importance, and this is in the purchase of instruments. Previous to 1891, owing to the practice of purchasing special and complicated instruments of the lowest bidder regardless of other considerations respecting quality of workmanship, etc., the service came into possession of a number of instruments of very inferior quality.

A cheap and imperfectly made mechanism gets out of order after a little use. Observers, in their reasonable endeavors to remedy the defects and lacking not only special mechanical skill but proper tools and appliances as well, can hardly improve what was a bad instrument at the start. Such a mechanism is sure to get worse and worse and must finally be replaced. The money spent for them is almost wasted. If well made in the first place the automatic instruments we are now using, with the exception of certain wearing parts which can be renewed from time to time, will last an indefinite number of years. I have, therefore, to repeatedly deplore the continual tendency to purchase such supplies of special and technical mechanisms from the lowest bidder, without a free consideration of the quality, workmanship, durability, etc. These instruments are not regular stock articles of the commercial markets, like clocks, tools, stationery, etc. They must be manufactured specially for our uses, and often the articles furnished by the lowest bidder are the least trustworthy, durable, and economical.

LIBRARY.

During the year there were added to the library 810 books and 720 pamphlets, making a total added of 1,530. Of this number 485 books and 620 pamphlets were obtained by exchange or gift, while 325 books and 100 pamphlets were purchased. Hence, out of a total accession of 1,530 numbers 1,105 were obtained by exchange or gift and 425 were purchased. The average cost of the books and pamphlets purchased was about $1 per number. The library now contains 20,471 books and pamphlets.

Two-hundred and ninety-three volumes were bound during the year. The binding was well done, but it is desirable to shorten very much the time of retaining books in the bindery. In one instance the books of a certain requisition were not returned to the librarian for nine months after leaving his possession.

At the beginning of the year $1,200 was allotted out of the contingent fund for the purchase of books, but of this amount less than $450 were spent during the year, further recommendations for the purchase of books having been disapproved. For the fiscal year ending June 30, 1895, it is hoped that the full amount recommended will be

allowed so that the more important current literature of meteorology and climatology, as well as the missing numbers of the more valuable sets now in the library, may be purchased. In making estimates for the year 1895-96 it is earnestly urged that the amount allotted be restored to $1,500, the amount allowed for the year 1892-93.

BIBLIOGRAPHY.

In the fall of 1893 authority was granted to print, as a bulletin of the Weather Bureau, a section of the bibliography. This section comprises about 2,500 titles, being references to practically all that has been published upon weather forecasting and prognosticating from the origin of printing to the end of 1892.

Very little has been done in adding to the general card catalogue of meteorology during the year, owing to frequent changes in the clerical force of the library and to the long illness of the employee chiefly engaged upon this work. Special efforts will be made during the present year to extend and improve this valuable index to the literature of meteorology. Of especial value at this time is the section comprising about 15,000 titles, bearing upon questions of local and general climate of all portions of the globe. The printing of this section would form an octavo volume of about 800 pages and would cost about $2,500.

THE WEATHER BUREAU EXHIBIT AT THE WORLD'S FAIR.

The exhibit of the Weather Bureau was under the supervision of Prof. C. F. Marvin, chief of the instrument room. It was arranged with a view to presenting to the visiting public in a forceful manner the greatest possible amount of information respecting the organization, functions, and purposes of the Bureau, and by actual objective demonstrations, accompanied by verbal explanation, to exhibit fully its methods and daily operations.

The exhibit was installed in a separate building, located near the main Government building and adjoining the buildings and exhibits of the Life-Saving Station, Naval Observatory, and the Light-House Board. Thermometers, rain gauges, anemometers, and other instruments were exposed upon the roof of the exhibit building in the most approved way, and complete automatic records of the various conditions were registered in the exhibit room on the ground floor. In addition there was displayed a complete collection of meteorological instruments of every kind, many of them maintained in continuous operation, and illustrating the taking of meteorological observations.

A separate section of the exhibit comprised a complete working forecast division. Here a duplicate copy of the regular 8 a. m. telegraphic weather reports, in cipher, was received each morning, except Sunday, and, in the presence of the visitors, the reports were translated, the data tabulated upon the regulation manuscript weather charts, and every operation necessary for the preparation of a complete weather map, with synopsis and forecast for the next thirty-six hours, was carried out in detail.

The third feature of the exhibit consisted of a complete equipment for the lithographing printing of a one-quarter-size daily weather map for the dissemination of the daily weather report, synopsis, and forecast, as mentioned above.

The fourth portion of the exhibit pertained to the great amount of climatic and meteorological data accumulated from many years of observation, which, in greatly condensed shape, was displayed in a

striking and graphic way by a selected series of finely-executed charts of large size, together with numerous publications, bulletins, etc., held for judicious distribution.

Attendants in charge conducted visitors over the exhibit, explaining, in logical order, the instruments and manner of making observations, and from thence, step by step, through the processes of weather map making, map printing, and the general principles of weather forecasting. The behavior of storms, their development and progress across the United States, were explained and illustrated by reference to files of the Washington weather map, wherein the advance of typical storms across the continent could be plainly followed. This latter discussion proved so highly instructive and interesting to visitors that a demand at once arose for pamphlets descriptive of this matter for free distribution. This was partially supplied by printing and binding a series of small-sized weather maps exhibiting the complete history of a storm of typical character during its passage across the continent, accompanied by a brief explanatory text. The pamphlet was entitled The Development and Movement of Cyclones, as exhibited by the morning and evening weather maps of April 2–6, 1892. It was wholly prepared and printed at the exhibit building, the edition being limited by our capacities for printing to about a thousand copies only. Many more could have been used, and even yet requests are received at this office, by mail, for this pamphlet.

The daily edition of weather maps ranged from 400 and 500 to over 3,000, according to the attendance at the fair. A total of about 200,000 base maps were expended in the daily issues during the entire period of the fair. This represents but a fraction of the number of persons who visited the building.

In order to avoid wasteful and useless distribution, the pamphlets, bulletins, instructions, etc., were sent by mail, and only to persons sufficiently interested to make verbal request for such publications as they desired, and to leave their names and post-office addresses, etc.

The exhibits of the Bureau, according to the classification of the Bureau of Awards of the World's Columbian Exposition, were classified in but two classes, and, by their rulings, could compete for a single award only in each class. Two medals and diplomas have been awarded, as follows:

MEDAL AND DIPLOMA COMPRISING EXHIBITS.

(1) Daily weather map making and weather forecasting.
Meteorological and climatic maps, charts, etc.

(2) Collection meteorological instruments in operation.
Triple register recording wind velocity and direction, and the duration of sunshine.
Marvin's electrically recording tipping bucket rain gauge.
Marvin's electrical sunshine recorder.

Under act of Congress the Board of Lady Managers of the World's Columbian Exposition was authorized to issue diplomas of honorable mention to those expert artisans, inventors, designers, and others who contributed directly to the construction and preparation of such exhibits as received awards. Pursuant to request, the names of the following employees of the Weather Bureau were certified to the Board of Lady Managers, and have received copies of the diplomas of honorable mention, viz:

Dr. H.C. Frankenfield, forecaster; Prof. H. A. Hazen, designer; Mr. R. F. de Grain, draftsman; Mr. Chas. P. Calvert, draftsman; Mr. Chas. B. Tuch, expert artisan, and Mr. D. T. Maring, inventor.

REPORT OF THE CHIEF OF THE BUREAU OF ANIMAL INDUSTRY.

SIR: I have the honor to transmit herewith a report of the work of the Bureau of Animal Industry for the fiscal year ending June 30, 1894.

Respectfully,

D. E. SALMON,
Chief.

Hon. J. STERLING MORTON,
Secretary.

MEAT INSPECTION.

The inspection of meat has, during the last fiscal year, constituted the most important and extensive part of the work of this Bureau. The ante-mortem and post-mortem examination has been extended to hogs at the various abattoirs where inspection has been established, thus greatly increasing the field of this service and more nearly fulfilling the object of the law.

The meat inspection is now in operation at 46 abattoirs, situated in 17 cities, and the greater part of the meat prepared for the interstate and export trade is inspected. There are, however, a number of large cities from which a great amount of meat is shipped to other States or to foreign countries, which, up to the present, have either inadequate inspection or none at all.

The extension of the inspection has necessarily been slow on account of the difficulty of obtaining competent inspectors, and the time required to organize the work and make it satisfactory at the different points. It has been found desirable to change many details in the methods of conducting the business and to require more specific reports from the inspectors in order to prevent evasions of the regulations and to maintain a closer supervision of the work from the central office.

These changes have now been effected at each of the various places where the inspection is conducted, and the Bureau is prepared to extend the service as rapidly as the necessary inspectors and other assistance can be supplied.

The number of animals inspected has been increased from 4,885,633 in the preceding fiscal year to 12,944,056. This increased number handled, together with improvements in the methods, has reduced the expense of the inspection, exclusive of the microscopical examination of pork, from 4¾ cents per head in 1893 to 1¾ cents per head in 1894.

MICROSCOPIC INSPECTION OF PORK.

The quantity of microscopically examined pork exported during the year was 35,437,937 pounds, as compared with 20,677,410 pounds in 1893. The trade has therefore very largely increased; and this has

been due partly to the fact that American firms have had more time to establish their business in the countries which formerly prohibited our pork, but for the most part to the lower prices which have prevailed in the United States during the last year. The greater part of the microscopic inspection is conducted with samples taken from the carcass at the time of slaughter. A considerable quantity of pork has been inspected in the piece, however, after the meat had been cut and cured.

The expense of examining the samples from one piece of pork is as great as that of examining samples from a whole carcass, and frequently greater, on account of the meat being hardened in curing and more difficult to prepare for microscopic examination. It is, therefore, more economical and in every way preferable to examine samples from the carcass before this is cut if other conditions are the same.

It has been found in practice that there are sometimes occasions when it is necessary to examine in the piece in order to enable the packing house to make a shipment of the required amount of cured pork within a limited time. There are also packing houses which have had so few orders for inspected pork from countries requiring this inspection that it has been found more economical to inspect the cured pork in the piece when ordered than to inspect a great quantity of pork in the carcass which might never be demanded for this trade.

During the year samples from 1,372,410 carcasses or pieces have been examined. The expense of this inspection has been diminished from $8\frac{3}{4}$ cents per carcass or per piece in 1893 to $6\frac{5}{9}$ cents in 1894—being a reduction of about 25 per cent in the cost for a given amount of work.

The reduction in the cost of inspection as compared with the quantity of microscopically examined pork actually exported has been even more gratifying. During the fiscal year 1893 there was exported 20,677,410 pounds of inspected pork, and the cost of the inspection amounted to $172,367.08 or 0.833 cent for each pound exported. For the fiscal year 1894 the quantity exported was increased to 35,437,937 pounds and the cost of inspection reduced to $88,932.10 or 0.248 cent for each pound exported.

A similar statement concerning the first and second halves of the last fiscal year shows that this reduction in the cost of microscopic inspection, compared with the quantity actually exported, was progressive throughout the year, and reached a lower limit than is indicated above. That is, from July 1, 1893, to December 31, 1893, the quantity of inspected pork exported was 12,618,706 pounds, and the expense of the microscopic inspection was $53,433.68, or 0.423 cent for each pound exported; while from January 1, 1894, to June 30, 1894, the quantity of inspected pork exported was 22,819,231 pounds, and the cost of inspection was $35,488.42, or 0.155 cent for each pound exported.

INSPECTION OF EXPORT ANIMALS.

In the inspection of animals for export 725,243 head of cattle were inspected, as compared with 611,542 for the preceding fiscal year. The number of cattle exported to Europe was 363,535 for 1894 and 294,002 for 1893, an increase of 69,533, or more than 25 per cent. There have also been exported to Europe during the year 85,809 head of sheep. All of these animals were inspected and their healthfulness certified to by the inspectors of this Bureau, and the cattle were all tagged with numbers for identification, and their origin recorded.

Of the cattle exported 184 were rejected, as compared with 292 rejected during the year 1893.

VESSEL INSPECTION.

The vessels carrying the exported cattle and sheep were all inspected by the officers of this Bureau, in accordance with the act of Congress approved March 3, 1891, in order to secure sufficient ventilation, an adequate supply of food and drinking water, competent attendants, fittings sufficiently strong to avoid unnecessary danger of washing overboard, and enough space for the animals to stand in with comfort. The regulations adopted in 1891 are still in force, but they have been amended from time to time and the condition of the cattle in transit has been continually improved.

This improvement is shown by the marked decrease in the proportion of cattle lost at sea. The loss for each year since the regulations went into effect was as follows: 1891, 1.6 per cent; 1892, 0.875 per cent; 1893, 0.47 per cent, and in 1894, 0.37 per cent.

The loss of sheep has been much heavier. Of the 80,898 exported and shipments inspected in Great Britan during the fiscal year, 1,050 were lost at sea. This is 1.29 per cent, and it indicates that more stringent regulations must be enforced to secure the humane treatment of these animals on shipboard.

STOCK YARDS INSPECTION.

An inspection at a number of the important stock yards of the country is maintained for the purpose of inspecting and tagging export cattle as near to their place of origin as possible. After being tagged and recorded, there is a supervision of the shipments in order to prevent infection of any kind on their way to the seaboard.

One of the greatest dangers during the summer months has been infected pens in the stock yards, or infected alleys, streets, or cars which have been contaminated by cattle from the Southern fever district. The cattle from this district, though apparently healthy, may so thoroughly infect the avenues through which they pass that these will be deadly for other cattle during the remainder of the season. This infection results as a consequence of adult ticks dropping from the cattle. These ticks lay about 2,000 eggs each, from which the young hatch in due time. It is these young ticks which get upon susceptible cattle and produce disease, as was shown in the special report of this Bureau on Texas or Southern cattle fever.

It has, therefore, been found necessary to set apart separate pens and alleys for these Southern cattle, and to disinfect the cars in which they have been shipped. To secure the enforcement of these regulations constant supervision and inspection must be maintained, for otherwise infected cattle would be allowed to enter the pens in which export cattle were handled, and this would do away with any possible chance of guarding against the infection. It is almost impossible in the present state of our knowledge to satisfactorily disinfect cattle pens which have once been thoroughly infected with this disease. Nothing but the freezing of winter can be relied upon to accomplish this. Infected pens are, consequently, a source of danger until after a succeeding winter has purified them.

The stock yards inspection is designed to guard against the Southern fever infection, but it also embraces the inspection and tagging of export animals, and the inspection of the vessels which carry them. These different lines of inspection are so closely allied that they can not be separated without detriment to the service and increased expenditures. It should be borne in mind, however, that the entire expense of the stock yards' inspection is not for the benefit of the export trade, but

that the cattle which are to remain in this country, more particularly the "feeders," are also protected.

The losses from the Southern or Texas fever have been almost entirely prevented by this inspection, and cattle may now be moved through our largest stock yards without danger, while before it was inaugurated a large part of the cattle so handled became infected.

This inspection, as it only continues during the spring, summer, and fall months, is reported for the calendar instead of the fiscal year. In the quarantine season, extending from February 15 to December 1, 1893, there were inspected and placed in the quarantine pens 1,737,380 head of cattle. In addition to this, the inspectors had 56,406 cars cleaned and disinfected under their supervision, and inspected 20,075 car loads of infected cattle which were en route for places beyond their jurisdiction.

INSPECTION IN GREAT BRITAIN OF ANIMALS FROM THE UNITED STATES.

This inspection has been continued during the year by two inspectors, one being stationed at London and the other at Liverpool. The object of this inspection is to learn the condition in which animals arrive, the extent of the losses at sea, the diseases with which animals in transit are affected or from which they die, the adequacy of the ventilation and fittings of the vessels for the safe transportation of their living freight.

This information can only be obtained from the representatives of this Bureau, who examine the animals both before and after they are unloaded from the ships. By means of this information improvements have been made by which the losses at sea have been reduced from 1.6 per cent the first year of the service to 0.37 per cent during the last fiscal year. This means a saving of 4,470 head of cattle on the exports of the last year. How much was saved by the regulations of the first year over the unregulated trade, we have no data to determine, but it probably was a still larger number.

The British restrictions have not yet been removed from our cattle trade, but with the continued freedom of the United States from pleuropneumonia and other contagious diseases dangerous to the stock interests of that country, it is probable that reasonable modifications will be made.

The entire expenses of the stock yards, vessel, and export animals inspection for the year was $96,617.44. At least half of this expense is for the prevention of Texas fever in this country, and should not be charged against the export inspection. This would give an expenditure of about 10¾ cents for each animal exported. Considering that this covers the tagging of every animal, and two inspections in the United States, and one in Great Britain for the greater part of them, as well as inspection of the ships and supervision of the loading, it is seen that the service is very economically performed.

Following this estimate to its legitimate conclusion, we find that the $48,308.72, which we estimate was expended in inspecting and quarantining 1,737,380 head of cattle from the district infected with Southern, or Texas fever, makes the cost of inspection 2.7 cents per animal, with no allowance for the disinfection of 56,406 cars.

INSPECTION AND QUARANTINE OF IMPORTED ANIMALS.

The number of animals imported from Europe inspected and quarantined on arrival was 11 head of cattle, 565 sheep, 43 hogs, and 4 goats quarantined at Garfield, N. J., and 1 head of cattle and 179 sheep

quarantined at Patapsco, Md. In addition, 3 head of cattle imported from Canada were quarantined at Buffalo, N. Y. This makes a total of 806 imported animals that were quarantined during the year.

Under the provisions of the act of Congress approved August 30, 1890, requiring the inspection of all cattle, sheep, and hogs imported into the United States from foreign countries, there were inspected as imported from Canada 194 head of cattle, 240,497 sheep, 1,302 hogs, and 2 goats.

SCIENTIFIC INVESTIGATIONS.

In the scientific work of the Bureau very important investigations have been made concerning the prevention of Southern cattle fever and in regard to the causation, nature, and prevention of tuberculosis and other diseases of animals.

Outbreaks of disease have been investigated in various parts of the country to determine if they were dangerous to the live stock of other States. Important investigations in the treatment of hog cholera have been made which have given very promising results.

Large quantities of tuberculin and mallein have been made in the laboratory of the Bureau and distributed to State authorities, State experiment stations, and educational institutions, as a means of determining the existence of tuberculosis in milch cows and of glanders in horses.

During the fiscal year ending June 30, 1894, there has been sent out tuberculin sufficient for 5,500 injections and mallein for 1,000 injections. The largest amount has been sent since January 1, 1894. It is now being used at the rate of 2,000 injections per month, with applications on file for as much as 1,000 injections per week from one State alone. Supplies have been sent on the application of the proper authorities to 33 different States.

PUBLICATIONS.

There have been published during the year the following reports and bulletins:

Eighth and Ninth Annual Reports of the Bureau of Animal Industry for the years 1891 and 1892. Published by order of Congress.

Bulletin No. 3. Miscellaneous Investigations Concerning Infectious and Parasitic Diseases of Domesticated Animals.

Bulletin No. 4. A Revision of the Adult Cestodes of Cattle, Sheep, and Allied Animals.

Bulletin No. 5. Report of the Dairy Industry of Denmark.

Bulletin No. 6. Additional Investigations Concerning Infectious Swine Diseases.

APPROPRIATION AND EXPENDITURE.

The appropriation for the year was $850,000 and the expenditures $495,429.24, leaving an unexpended balance of $354,570.76 to be turned into the Treasury.

REMARKS ON THE CONDITION OF THE SERVICE AND RECOMMENDATIONS FOR THE CURRENT YEAR.

The meat inspection of the Bureau has not yet been developed and extended as contemplated in the law under which it was established. There are many large abattoirs which kill for interstate or foreign trade,

and even some cities doing a large business of this character which have no inspection. It is really illegal for meat from such abattoirs to be shipped from one State to another, but if the operators of such establishments are unable to obtain inspection the Department would hardly be justified in stopping the marketing of their products.

The chief difficulty in rapidly extending the inspection is the failure to obtain a sufficient number of competent inspectors. The inspectors and assistant inspectors have been placed in the classified service; they are required to be graduates of a recognized veterinary college and to pass an examination held by the Civil Service Commission to test their competency. In the first examination only three passed out of over thirty candidates. That the examinations are not too difficult is shown by the fact that the lowest of the three eligibles is plainly demonstrated by his papers to be unfit for an inspector.

I believe that the reason so few competent men take the examination is that the salary of $1,200 for an assistant inspector and $1,400 for the majority of the inspectors is too low, considering the requirements and the nature of the work. Every inspector should have a good general education and thorough professional training. He should, in addition, be required to give up all private practice and devote his entire time to the work of the Bureau.

Meat inspection is very arduous work if properly performed. It requires long and irregular hours, constant attention, careful and thorough examination of the meat, and it must be performed in a damp place and in an atmosphere filled with steam, which is unpleasant in summer and both unpleasant and unhealthy in winter. It apparently requires more inducement to secure competent men for this work than is now offered and I would, therefore, recommend that the salary of assistant inspector be raised to $1,400 and that the lowest salary for inspector be fixed at $1,600.

With this change, I believe that a sufficient number of competent inspectors might be obtained during the year to make it possible to establish inspection at all of the large abattoirs, and thus avoid charges of injustice and favoritism, and at the same time prevent the shipment of uninspected meat from one State into another. At present some of the inspectors at important places are young, inexperienced in business methods and professionally incompetent, and should be replaced at the earliest possible moment with competent men.

REGULATIONS FOR SECURING THE DESTRUCTION OF CARCASSES UNFIT FOR FOOD.

The meat inspection law as it now stands contemplates the destruction of condemned carcasses under the direction of the State or municipal authorities. This is a serious imperfection, and unless it is corrected the meat inspection service can not accomplish the results expected of it.

In most places there are no local inspectors to cooperate for this purpose. There are in nearly every city more small slaughter-houses where animals are killed exclusively for local consumption than can possibly be inspected by the local inspectors. As a consequence the Federal inspectors are expected to see that meat unfit for food is not used for that purpose.

The only way to be certain that unwholesome meat is not used for food either locally or through the interstate trade is to see at once that every piece discovered is destroyed. If it is left for a local inspector

to condemn, or if the packing house is allowed to dispose of it with the understanding that it is not to go into the interstate or foreign trade, there is no certainty that it will not be canned or shipped in some other form. Many of the people engaged in the meat packing business have shown themselves to be unscrupulous; and, as it is impossible with any force at our command to watch every part of any great packing house at all hours of the day and night, it is plain that nothing less than the prompt seizure and destruction of unwholesome meat will protect the consumer.

A bill has passed the House of Representatives and is now pending in the Senate which will, if it becomes a law, give the Secretary of Agriculture power to make the necessary regulations for the proper disposal of diseased carcasses. I would recommend that its early passage should be urged. When we consider that 4,127 carcasses of beef were condemned during the past year as unfit for food, the importance of early action is manifest.

INSPECTION OF IMPORTED HORSES.

There is at present no veterinary inspection of horses imported into the United States. The law requiring the inspection of other species of animals was doubtless intended as a protection for the food supply of the country, and the matter of guarding against the contagious diseases of horses was not considered.

It is, nevertheless, certain that an inspection is needed in order to prevent the introduction of various kinds of contagion with imported horses. The disease known as *maladie du coït* was introduced and has been repressed by considerable expense to the Federal Government and has also been the cause of much anxiety and expense in some of the States.

Glanders may also be introduced with imported horses, and no doubt has been so introduced in many instances.

I would recommend that this needed inspection should be again brought to the attention of Congress, in order that, if deemed best, the Department should be given the necessary authority.

ADDITIONAL REGULATIONS NEEDED CONCERNING IMPORTATION OF CATTLE FROM MEXICO.

Renewed importations of cattle from Mexico make it imperative that the regulations concerning the importations of cattle should be so modified as to bring them into harmony with the act of August 30, 1890. This act provides for the inspection of all cattle imported into the United States, and prohibits the importation of any animals of this class which are infected or have been exposed to infection so as to be dangerous to the animals of this country.

There can be no question as to the prolongation of the Texas fever districts into Mexico covering the sections adjacent to the Gulf and Pacific coasts. Just what the extent of these infected districts may be it is impossible in the absence of detailed investigations to determine. It is plain, however, that, as the Government of Mexico has not investigated the subject and outlined these districts, this Government can not decide what sections of that country are infected and what sections are free from infection.

In the United States the Texas fever district is defined by the regulations of the Secretary of Agriculture concerning cattle transportation.

Cattle from this district are allowed to be shipped to other sections of the country for immediate slaughter only during the season of the year when the disease may be communicated. The cattle raisers of this great district are entirely shut off from the northwestern market for grazing or range cattle.

During the last few weeks large numbers of Mexican cattle have been imported to be sold for grazing purposes in the Northwest. These cattle come without having been subject to any regulations in the country of their origin, to determine whether they are infected or free from infection; and they have been going into a market from which a large part of the Texas cattle are excluded.

Imported Mexican cattle are required to be held for inspection as provided in the law, but inspection of large herds of these wild cattle can not be thorough and should not be relied upon to prevent the introduction of disease. It is my opinion that, until the Mexican authorities define the Texas fever district, and provide competent inspectors to certify that the cattle coming from that country are free from infection, all Mexican cattle should be treated as infected.

This certainly is the only safe plan to adopt, because owing to the low price of Mexican cattle the speculators will not confine themselves to purchasing from the elevated sections, which are presumably free from infection, but will extend their operations into the lower and more dangerous regions. It would, therefore, be but a short time until the range country and the grazing States would be overrun with these cheap cattle, carrying the Texas fever infection with them and causing such outbreaks of disease as we have not had for many years.

If the cattle from the infected district in the United States are only allowed to go to market for immediate slaughter, equally rigid restrictions should be applied to infected cattle from Mexico, and as there is no way of determining which are infected and which are not, all cattle from that country should be regarded as infected. Regulations to this effect would, however, entirely prohibit the importation of Mexican cattle, because they are not fit for immediate slaughter and would not be imported for that purpose; and also because the statutes prohibit the importation of infected cattle.

It seems clear that under the law Mexican cattle should be declared infected from February 15 to December 1, which is the period that the Texas fever regulations are applied to the cattle of the United States; and I would recommend that such regulations be at once adopted.

It has been stated by Arizona cattle men that large numbers of their cattle stray across the border into Mexico and that likewise large numbers of Mexican cattle stray into Arizona. Some of these men represent that it would require 15 inspectors to inspect such stray cattle as are being returned at this season of the year.

The probability is that such an inspection is not necessary as a protection against disease, since the cattle would not stray far enough to reach the infected districts. I have, therefore, provisionally discontinued such inspection, as there were not enough inspectors available to promptly inspect all of the cattle that were to be returned.

It appears to me, however, that there is a great opportunity offered, by this practice of returning large numbers of stray cattle, for defrauding the revenues of the Government. An inspection would probably be a great protection against such frauds, and the matter is therefore submitted for consideration, but without recommendation, as the matter of revenues has no connection with the duties of this Bureau.

THE WORK IN REGARD TO TUBERCULOSIS.

The testing of cows with tuberculin in the District of Columbia is now in progress, but has been commenced in a small way in order to develop a satisfactory plan of operations. About 125 cows have been tested, and 20 per cent of these found affected.

I would now recommend a larger force and more vigorous operations. With the present force and facilities, but a few thousand dollars can be used during the year out of the $100,000 appropriated for this purpose. With twice as many men and better facilities for getting over the ground several times as much work can be accomplished.

As tuberculous cows are taken out of the dairies new animals must be put into their places, and it is desirable that these should be tested before they are allowed to enter the stables which have been freed from disease and disinfected. To do this at present the herd inspection must be interrupted, and as the number of inspected herds increases, the interruptions will be more frequent until the herd inspection will be entirely stopped. It is important, therefore, that men should be stationed at the stock yards to test all cows that are brought into the District. This will prevent the further introduction of the disease, and will enable us to keep the herds free from it which have already been inspected.

This work in the District is of great importance, not only as a preventive of disease among the consumers of meat and milk, and to guard against the spread of tuberculosis from the District into adjoining States as required by law, but as an experiment to determine various questions relating to the prevalence, recognition, and prevention of tuberculosis as affecting dairy stock. The scientific results of this work are, therefore, of great value to the whole country, while the practical work is of benefit to only a small section. These scientific results are urgently needed in order that the various States may formulate proper measures for protecting their citizens, and for that reason, if no other, the work should be pressed to early completion.

Under any circumstances only a small part of the amount appropriated can be expended during this fiscal year, as one-third of the year has already elapsed. More rapid work also means more thorough work. There is less opportunity to shift diseased cows from the uninspected to the inspected dairies, and the first inspection should be completed before a second one is necessary.

Detailed recommendations as to requirements will be made from time to time as occasion demands.

EXTENSION OF THE BUREAU WORK.

The work of the Bureau of Animal Industry is now confined almost entirely to animal diseases. The meat inspection, the export cattle inspection, the stock yard inspection, the import cattle inspection, the tuberculosis work, the scientific investigations, all relate to diseases. The law, however, contemplates that there should be investigations in regard to the condition of the animal industries, with the distribution of information calculated to improve them and render them more profitable.

The dairy industry should receive immediate attention and efforts should be made to improve its condition by collecting and distributing information on the subject and in that manner educating our dairymen. The results obtained by Canada in this direction are very interesting and instructive. It is not many years since cheese from the United

States was preferred in the London markets to Canadian cheese and brought a higher price. The Canadian Government, however, began a systematic effort to educate the dairymen of that country. Printed information was distributed; practical men were sent to demonstrate improved methods, and the importance of making a higher grade of products was constantly taught.

The results of these systematic and persistent efforts have wrought such great improvement that Canadian cheese is now preferred in the London markets to that from the United States. The Canadians have enlarged their foreign market and secured better prices for their products.

No one can doubt the importance of improved dairy methods in the United States. They are needed to secure better prices at home, and to retain and recover the foreign markets. Our dairymen need persistent and authoritative instruction as to the advantage and profit to them of breeding better cows; of feeding the best combinations of food; of handling their milk, butter, and cheese according to the most improved and scientific methods.

The beef cattle industry, the sheep industry, the swine industry, the poultry industry are equally in need of assistance of the same nature. The law authorizes the collection and dissemination of information for the benefit of all of the animal industries, and it appears to me that the time has come when an effort should be made in this direction.

In considering this question in the past it has always been thought necessary to establish a dairy division, a poultry division, and in general a division for each branch of work. Having recently given some thought to this subject, I am of the opinion that a competent man could be selected who would be able to cover all of these additional subjects. I feel certain that for $2,500 per annum it would be possible to secure a man who could do creditable work in all of these fields. He should be not only versed in the subjects mentioned, but he should be accustomed to preparing and editing reports. Such a man, with one or two clerks, would be able to inaugurate this much needed line of work, and besides could assist in preparing the Bureau reports for publication.

I would recommend that an appointment of this character be made at an early day, as in my judgment the development of the Bureau has been one-sided and abnormal considering the breadth of the organic act. Operations are in progress in all directions for preventing disease, and for guarding against the consumption of diseased meats, but very little is being done in other ways to assist those great industries, the interests of which, so far as the Federal Government is concerned, are committed to this Bureau.

APPROPRIATIONS FOR THE FISCAL YEAR ENDING JUNE 30, 1896.

I would recommend that the sum of $800,000 be placed in the estimates for the salaries and expenses of this Bureau for the next fiscal year, and $12,000 for the maintenance of the quarantine stations for neat cattle. These sums are the same as were appropriated for the current fiscal year, and will, I think, be ample.

REPORT OF THE STATISTICIAN.

SIR: I have the honor to transmit herewith my report for the fiscal year ending June 30, 1894.

Respectfully, HENRY A. ROBINSON,
Statistician.

Hon. J. STERLING MORTON,
Secretary.

During the fiscal year ending June 30, 1894, the Division of Statistics continued and enlarged its work in connection with the crops of our own country, reporting on their condition from month to month during the growing season.

REPORTS ON OUR PRINCIPAL CROPS.

At the close of 1893 it presented estimates as to the area, product, and value of the principal crops of that year. To obtain the data for this final report, nearly 135,000 circulars, including about 120,000 addressed to selected farmers, were sent out. Of these, over three-fourths were returned, and their systematic arrangement, with the consolidation of the returns which they contained and the large amount of tabulation and computation involved in this work, occupied nearly the whole clerical force of the office for a considerable period. In the spring of 1894 the usual spring investigation was made as to changes in the areas of the leading crops of the country, the results being published in the report for May.

From 1889 to 1892, inclusive, no estimates had been made by the Statistician as to rye, barley, buckwheat, potatoes, hay, or tobacco, for all of which the area, product, and value were estimated for 1893. At the request of many growers and dealers, rice has been added to the list of products reported on in the monthly crop reports, the first reports on that crop having been published in the report for June last.

A review of the weather conditions of the season of 1893, and of the condition of the crops as affected by these and other causes, was published in connection with the annual crop statistics in December, as also were statistics of farm prices and market quotations for our chief agricultural products, and a statement of our imports and exports of agricultural products in general.

A seasonal review of the cotton crop of 1893, noting the meteorological conditions by which its growth and condition were affected from planting to picking, was published in the report for January-February, 1894. This included remarks of the State agents from the States in which cotton is grown.

The annual investigation as to the quantity of corn and wheat in farmers' hands on the 1st day of March involves a large amount of labor. The results of this investigation for 1894 were published in the March number of the Report of the Statistician, together with a comparison with corresponding data for a number of years and a review of the production and distribution of these cereals for a considerable period. A carefully prepared review of the "Supply and distribution of wheat for twenty-five years" was published in the same number.

TRANSPORTATION RATES, PRICES, ETC.

The regular returns on transportation rates, domestic and transatlantic, were prepared and published each month. This valuable feature of our reports has grown to large proportions from a small beginning, and embraces returns from the principal railroads of the country, steamship lines, canal, lake, and ocean companies. The rates published are valuable to the shipper and exporter.

The usual investigation as to the number, value, and average prices of farm animals at the beginning of the calendar year, and that in regard to their condition on April 1 and the losses which occurred among them during the year ending at that date, were carried out for 1894, their results being published in the report for January–February and in those for March and April, 1894.

A table showing the wholesale prices of a number of the principal agricultural products at leading cities in all sections of the United States was prepared and appeared in the Report of the Statistician for March, 1894.

SPECIAL INQUIRIES AND REPORTS.

In emergencies, such as sudden freezes or severe drought, special circulars are quickly prepared and forwarded to our correspondents, and the information contained in the returns is speedily prepared for publication. One such special circular was issued after the severe freeze in the latter part of March, 1894, and the information thus obtained was embodied in the April report of the division.

A careful investigation as to the cost of producing wheat and corn elicited returns from nearly 30,000 farmers and over 4,000 experts, among whom are many graduates of various agricultural colleges now engaged in farming. The results were published by States and by sections in the case of the returns from leading farmers, and by States in the case of those from experts, appearing in the Report of the Statistician for March, 1894. The preparation and distribution of circulars for this investigation and the reception, arrangement, and consolidation of the returns involved a large amount of labor.

Two other special inquiries related, respectively, to the average weight of the fleece of wool-bearing sheep in the United States and to the health of the people, with the diseases most prevalent in different States and sections.

The bulletins of the United States Census Office on a number of subjects of interest to farmers have been condensed for publication in reports of the Statistician from time to time. The subjects thus presented during the last fiscal year embraced dairy products, poultry and eggs, honey and beeswax, and increase or decrease in the number and value of farms by States and Territories. A statement of wheat production in census years since 1869 was published in the report for April, 1894.

In some instances information of value found in private publications not likely to reach the farming class is presented more or less fully in the reports of the division. An example of this is afforded by an article on "The canning industry," published in the report for January-February, 1894.

The preparation of a report on leading features of our foreign trade, in which the relative magnitude of our agricultural exports was prominently exhibited, was included in the work of the year under review.

In the endeavor made during the past year to secure the most accurate data on the areas of crops, notably cotton and wheat, special and original circulars were prepared and information was sought from sources heretofore unsolicited. State aid was asked for, and in some instances responses were favorable, but in the main the active cooperation of the States could not be obtained.

THE STATISTICAL CORRESPONDENTS.

The efficiency of the corps of crop correspondents has been advanced and their number increased. Counties heretofore unrepresented by statistical correspondents are being represented as fast as competent men can be found to serve. Less difficulty is found in securing correspondents than formerly, as more attention is paid to their various requests. More publications of the Department were sent to these assistants during the past year than in any previous year since the organization of the division. The outlay thus incurred has been repaid by improved results, while giving increased satisfaction to the correspondents.

REPORTS ON FOREIGN AGRICULTURE.

The interests of the American farmer are largely affected by crop conditions in foreign countries, including alike countries whose products compete with his own and those which in varying degrees are purchasers of our agricultural surplus. Accordingly, the subject of foreign crops receives the careful and constant attention of the Division of Statistics. A special agent of the Department is located in Great Britain to keep a constant lookout during the growing season for information as to the condition of European crops and to keep watch at all times for such agricultural or commercial intelligence as may be of value to the farmers of the United States. His reports on European crops form quite a regular feature in the monthly reports of the Statistician.

Two other agents are employed in Europe and have devoted a large amount of energy to the work of extending the foreign market for our agricultural products. They have given special attention to Indian corn, seeking to diffuse among the people of Europe a fuller knowledge of the various uses to which it can be advantageously applied.

The official crop reports and trade reports of foreign governments, as well as other official documents bearing on the interests of agriculture, are secured as fully as practicable and are carefully examined in the division, their more essential contents (especially the official returns as to the principal crops) being published in the reports of the Statistician from time to time. In the case of some countries the final crop returns do not appear in printed form until a year or two after the harvesting of the crops to which they relate. They are, however, used as soon as practicable after their reception in the division. This branch of the work of the office received the usual amount of attention during the

year under review, and as the statistical work of foreign governments increases in fullness and improves in quality it tends to give increasingly valuable results, though at a cost of increasing labor in obtaining and examining the documents published, since these are increasing in number.

The census reports of foreign countries yield valuable materials from time to time. The areas and populations of the several provinces of Canada and of the Dominion as a whole, as ascertained by the census of 1891, were published in the Report of the Statistician for July, 1893.

TABLE ON THE WORLD'S WHEAT CROP.

A feature of the division reports which appears to be widely appreciated, is the table on the world's wheat crop, consisting in part of such official figures as are available when the table is prepared and in part of such unofficial estimates as are deemed most worthy of confidence. This table has been gradually increasing in fullness, as has also the proportion in which official estimates enter into its composition. While it occupies but little space, its compilation is a work of great care and extensive research, involving the examination of reports in various languages. The table prepared for the March number of the Report of the Statistician (1894), which presented the figures for 1893 in comparison with those for 1892 and 1891, covered a larger number of countries than any previous table of this series; and while information from many countries is still wanting, owing to the fact that no official data or trustworthy estimates in regard to them can as yet be obtained, the table is believed to be the nearest approach to a full statement of the world's wheat crop that has ever yet been made.

OTHER FOREIGN TOPICS.

Information on foreign import duties on wheat was published in July, 1893, and the report for June, 1894, contained the rates of duty levied on the principal cereals and on flour in European countries.

Under the heads of "Notes on foreign agriculture" and "Notes from United States consular officers" a large amount of information on agricultural matters was published during the year. Under the former of these captions were published a part of the official statistics of foreign crops already referred to, as prepared in the Statistical Division from the original documents, and an article of considerable length on "British agriculture," condensed from a report especially prepared for the occasion of the World's Columbian Exposition.

Among special articles wholly or partly on foreign topics which have been published during the year may be mentioned articles which appeared under the following titles: "Use of maize in the United States and Mexico," "Agriculture in China," "Sugar crop of the world," "Germany as an importer of our agricultural products," "The world's wool supply," "Agricultural development in Bosnia and Herzegovina," "World's supply and consumption of cotton," "Agricultural production in Mexico for 1889 and 1892," "Climate of Mexico, and Mexican railways."

APPLICATIONS FOR STATISTICAL DATA.

The correspondence of the office is extensive and involves a large amount of labor. It includes answers to inquiries made by members of Congress and by authors and other writers, both native and foreign, often *requiring* extensive statistical research in regard to agricultural products

of many countries and for long periods. The investigations thus called for are often of manifest public utility, and their results can either be utilized in the publications of the office or made auxiliary to its work in other ways. In all such cases it is deemed entirely proper to devote to this class of work an amount of labor which would not be justified were the results of advantage only, or even mainly, to the person seeking the information.

MONEY, WEIGHTS, AND MEASURES.

In dealing with foreign statistics the foreign denominations of measure, weight, and money have to be reduced to their American equivalents. Even where the equivalent is familiar the quantity of work involved in the simple processes of reduction is very great, and extreme care is required to assure the accuracy of results. But in many cases special research is necessary in order to ascertain or determine what the equivalents are. Especially is this the case with the equivalents of monetary units where the currency consists of silver or depreciated paper which is constantly changing in its relation to our own money. The reduction of values of crops, or of imports and exports of particular commodities, for a series of ten, fifteen, or twenty years, becomes quite a complicated operation where those values are expressed in such moneys, since it is then necessary to determine the approximate average value of the foreign monetary unit, as expressed in our own money, for each year of the series, and to do this it is necessary to trace the fluctuations of the foreign paper, and to consider not only the quantity of pure metal in the foreign silver dollar (itself expressed in a foreign denomination), but to trace the fluctuations of the silver market throughout the whole period to be covered.

The adoption of a uniform monetary system throughout the civilized world is, perhaps, too far in the future to have any practical interest from this point of view, but it is to be hoped that the gradual spread of the metric system of weights and measures, with its simple decimal relations, will ultimately do away with much of the labor incident to the reduction of foreign to American denominations. Indeed, it is so much in line with our own decimal system of money, whose simplicity we all appreciate, that our people may in time come to avail themselves of the legal provision which already authorizes the use of the metric system in the United States. If it were thoroughly taught in our normal and common schools the public might in time be made so familiar with it and with the relations between its units and those now in use as to render its adoption a comparatively easy matter. It is, in fact, already largely employed in the weighings and measurements of science, and its extension into the provinces of commerce and industry may reasonably be regarded as only a question of time, especially in view of the progress which it has already made towards the position of a universal system. For the present, however, there is no escape from the onerous labor of reducing a great variety of foreign weights, measures, and moneys to their equivalents in terms of those now in use among us, and to facilitate this work as far as possible additions are being made from time to time to the large store of information on this subject already accumulated in the division.

MISCELLANEOUS WORK OF THE DIVISION.

The care of the numerous reports, books, pamphlets, periodicals, and publications of various kinds that reach the division, and which form a part of the library of reference essential to its work, demands the entire

time of one clerk. During the past year satisfactory progress was made in arranging and cataloguing the contents of this library and placing it in such a condition that any publication contained in it can be immediately found when wanted.

The indexing of materials of statistical value found in agricultural and commercial newspapers and periodicals has for a number of years past received attention, and this work was kept up during the greater part of the fiscal year under review, one clerk having been mainly employed upon it, especially on the indexing of French and German publications.

During the last month of the World's Columbian Exposition at Chicago, an employee of the division devoted considerable effort to the collection of literature of statistical, economic, or scientific value found in connection with the exhibits of our own States and of foreign countries, or forming parts of such exhibits. The number of reports and other publications added to the library of the division, and those promised for the library of the Department which were sent on their release from the control of the custom-house authorities, amounted to hundreds of volumes, besides a considerable number of pamphlets.

The clerical force of the division addresses about 150,000 envelopes and official franks each month, in order to forward the monthly report and the synopsis thereof to those to whom these documents are respectively sent. The synopsis is also folded, inclosed, sealed, and mailed by the force of the division.

The facilities possessed by this division enable it to aid and expedite the business of the other divisions of the Department, circulars upon various subjects prepared in these other divisions being distributed from the Division of Statistics to the farmers embraced in the list made up in the latter division. This list embraces more than 120,000 names, systematically arranged, and the changes that continually occur among so large a number of persons necessitate no small amount of labor in keeping the list full and seeing that, as far as practicable, it shall comprise only the names of such farmers as will be of service to the Department in supplying it with trustworthy information when requested so to do.

While the above statement indicates in a general way the amount and character of the work done by the division during the fiscal year 1893–94, it is far from being a complete and detailed specification of the labors performed.

EXTENSIONS OF STATISTICAL LABORS.

Reports on some crops heretofore neglected as comparatively unimportant may hereafter be made, and steps have already been taken with a view to ascertaining the product of one of the most important of all our crops, namely, cotton, in regard to whose total product no precise estimate has been made for seven years past. Two special agents of the Department, appointed for this purpose, are now engaged in collecting such information and making such arrangements in the cotton States as may furnish the data for an estimate of the product of this crop for 1894, and it is hoped that still more complete and effective arrangements, as set forth further on, may be made for the ascertainment of the product of this crop in subsequent years. The estimated cost of the necessary organization for collecting the proposed additional statistics on cotton production and the movement of the cotton crop during the current fiscal year is from $6,000 to $7,000.

The reports on the condition of the rice crop begun in the closing month of the last fiscal year are being continued, and at the close of the season an effort will be made to obtain the data for an estimate as to the area and total product.

With a view to obtaining fuller and speedier information as to the agriculture and commerce of foreign countries, especially their commerce in agricultural products, application has been made to the Department of State to obtain for the Department of Agriculture the cooperation of our diplomatic and other representatives abroad in securing early information and in obtaining and forwarding official statistical documents.

The increased number of foreign documents which it is hoped the division will receive as a result of this cooperation of our representatives abroad, as well as the information which they may themselves obtain and forward to the Department of Agriculture, will give rise to additional labor for that part of the office force which is employed in foreign work. The topics on which it is desired to obtain the information referred to embrace the following among others:

(1) Conditions, favorable or otherwise, under which crops have been sown or planted; (2) conditions of the crops as affected by the weather and other conditions throughout the growing season; (3) area under each important crop and quantity produced; (4) differences between home supplies and amounts required for consumption, with surpluses for export or deficiencies to be supplied by importation; (5) method and cost of production of particular crops, especially such as compete with like crops of our own; (6) cost of transportation from place of production to place of consumption; (7) value of agricultural land devoted to such crops;* (8) value of agricultural labor employed in their production;* (9) extent to which agricultural machinery is used and character of such machinery.*

It may be said, in a general way, that information tending to make clear the conditions under which our competition with foreign agriculture must take place will be carefully sought. Another line of inquiry worthy of serious attention has reference to the difference between the prices received by the producer and those paid by the consumer, whether at home or abroad, and to the practicability of forming an approximately correct idea how far this difference is accounted for by necessary and legitimate expenses of transportation, handling, storage, etc., and how far, if at all, it may be due to extortion on the part of transporters and to the unfair operations of speculators.

Statistics as to the average consumption per capita in both our own and other countries of wheat and various other necessaries of life are among those which it is desirable to collect.

Many other subjects might be mentioned on which information may be sought in case the force of the office and the means at its disposal shall suffice for the undertaking; and many which can not now be foreseen will present themselves during the year on which it will be necessary to do the best that the means at command may render possible.

INDEXING PERIODICALS AND DOCUMENTS.

The system of indexing already referred to as in operation (thus far chiefly in the case of agricultural papers and periodicals in the French and German languages) might be advantageously extended, not only

* Items 7, 8, and 9 will necessarily be investigated as a part of the inquiry indicated by item 5.

to like publications in other languages, including our own, but also to foreign official reports, to publications of our own State governments, agricultural, horticultural, and other similar societies, boards of trade, chambers of commerce, and even to certain publications of the National Government, provided, of course, that it be carefully confined to such portions of the contents of these various publications as are likely to be of value in connection with the work of the office. Such a comprehensive system of indexing would go far toward putting the division in a position to give prompt responses to the numerous demands made upon it for information, much of which is desired in haste for important public uses by members of Congress and others. A system of records of foreign crops heretofore used in the office, as far as has been practicable, might be extended so as to contribute greatly toward the end just indicated—that of putting the office in a condition to make prompt response to inquiries—but for this and much other work requiring special skill and a knowledge of foreign languages the force of the office has been inadequate.

IMPORTANCE OF ACCURATE CROP REPORTS.

There is an axiom that whatever is worth doing is worth doing well, and this is particularly applicable to the preparation and publication of statistics of agricultural crops. The present system of crop reporting has often been proved of value by a comparatively close correspondence between its results and those ascertained through the census, or through the commercial record of the movement of crops; but in view of the magnitude of the interests affected by the opinions formed, whether on the basis of official statistics or otherwise, as to the quantities of grain, cotton, or other leading products grown in our country in any year, it seems highly desirable that not only the crop statistics of the Department of Agriculture, but those of the census itself, shall be collected in such a manner as to give the agricultural and commercial public the utmost possible assurance of their close approximation to rigid accuracy. Any serious and widespread doubt as to their correctness may do almost as much mischief as actual inaccuracy, or at least may almost as effectually defeat the useful objects for which they are intended. It is therefore desirable that, if possible, their substantial accuracy should be made indubitable.

Under the present system the statistics of area are based on those ascertained in the taking of the census, the reports on this subject made by the correspondents of the Department being given each year in the form of an estimated percentage of the previous year's area. Thus if the census area under wheat in a certain county were 15,000 acres and the area for the following year were reported at 105, or 5 per cent additional, the area for this latter year would be 15,750 acres. From this latter area again, by the aid of a like percentage estimate, the area for the next year is computed, and so on through the decade until another census furnishes a new basis. Under this system any inaccuracy in a census is, of course, perpetuated through the period intervening between that and the succeeding one, and it is, therefore, of great importance that the agricultural statistics of the census be correctly taken. To this end it is necessary that their collection be intrusted to careful and competent men; and without the least intention to throw any doubt upon the character and ability of the men generally selected for this work by the Census Office, the suggestion

may fairly be made that in the highly important matter of experience in such work, a large majority of them must from the very nature of the case necessarily be lacking.

AN ANNUAL CENSUS OF AGRICULTURE.

With this point in view, the advantages which would result from a system of annual agricultural censuses, taken by the body of experienced men who report to this office on the condition of the crops become sufficiently obvious; and if in some few cases the qualifications obtainable are not all that could be desired, this difficulty would be easily overcome if the Department were able to offer a suitable compensation for the additional work which the collection of the additional information here suggested would impose.

The points on which it is proposed to collect precise information after the manner of a census are—

(1) The area under each of the more important crops; (2) the aggregate product of each of such crops; (3) the quantities of wheat and corn in farmers' hands at some date between the conclusion of the spring sowings and plantings and the beginning of harvest; also the quantity of cotton remaining in the hands of planters either at the same date or at some other date to be determined upon; and (4) the number of farm animals on the 1st of January each year, or on some other suitable date.

It may possibly be found desirable and practicable to add other points, especially statistics of certain crops which are locally important though not widely grown, but it would be necessary to move with care and avoid undertaking more than could be successfully carried out or incurring too large an expenditure.

FACILITIES FOR ECONOMICAL WORK.

In order to economize as far as possible in the latter particular, an effort would be made so to arrange the dates of collecting information as to minimize the labor and cost of the operation. It is believed that one farm-to-farm visitation, made late in the fall, might suffice for the collection of all the data required; and after the system was once fully organized, our correspondents would learn by experience on what farmers within their respective counties they might rely to fill out correctly and return schedules sent to them by mail, thus greatly diminishing the number of farms which it would be necessary to visit. Moreover, as time advanced, experience in the filling of schedules would largely increase the number of farmers who might be so relied upon, and still further reduce the labor and necessary cost of collecting data. The correspondents would gradually acquire such skill as to make them a body of experts in the collection of these statistics, and the results of each year's work would thus be far more trustworthy than any which can be attained in a decennial census taken for the most part by inexperienced men; while a corresponding advantage would result from the expertness gained in a permanent central bureau, wherein the same kind of returns would be received, handled, and consolidated year after year. It is evident that under such a system there would be progressive improvement in the quality of results, while at the same time the expenses of the work could be reduced by the introduction from time to time of such economies of labor as experience would naturally suggest.

AN IMPORTANT INITIAL ADVANTAGE.

It would be an immense initial advantage to have at command a body of men, public spirited, of mature judgment and practical experience in agriculture, chosen under the present gratuitous system, under which merely self-seeking persons have had no inducement to press their services upon the Government; and there can be no doubt that the quality of the service obtained by putting these same men under pay for the special work indicated above would be vastly superior to that which could be secured through the appointment of new and inexperienced men. Moreover, the advantage in question would tend to perpetuate itself; because the traditions and practice of the Department favor the retention of correspondents as long as their work is found satisfactory.

An inquiry has been made as to the actual cost of collecting for the census certain agricultural statistics which may be considered about equivalent, as regards the labor of their collection, to those here proposed. That cost was not far from $800,000; and an appropriation of this sum for the work of collecting such statistics during the fiscal year ending on June 30, 1896, is therefore recommended; though it is believed that, in subsequent years, after the system is once in smooth working order, the proportional cost will be considerably less. The clerical labor of handling the returns and tabulating the data received will, of course, be larger than under the present system, and the increase will involve an addition to the necessary expenses of the Statistical Division. An appropriation of the amount above named might, however, be made to cover all expenses for the first year by retaining the present system for a time in States which, from an agricultural point of view, are of minor importance, and allowing the new system to be extended somewhat gradually, as experience is gained in the working of it, until it is found convenient and advantageous to apply it to the agriculture of the entire country.

REPORT OF THE DIRECTOR OF THE OFFICE OF EXPERIMENT STATIONS.

SIR: I have the honor to present herewith the report of the Office of Experiment Stations for the fiscal year ending June 30, 1894.

Very respectfully, A. C. TRUE,
Director.

Hon. J. STERLING MORTON,
Secretary.

CHANGES IN OFFICE FORCE.

Mr. A. W. Harris resigned the directorship of this office September 25, 1893, and the present director was at once promoted to succeed him. Mr. E. W. Allen was promoted to be assistant director, but retained his work relating to chemistry, animal production, and dairying. Mr. F. C. Test was appointed as expert assistant in horticulture and entomology. Mr. F. H. Hall was appointed as bibliographer. Mr. R. B. Handy was appointed as a special assistant for the preparation of a bulletin on the cotton plant and farmers' bulletins. Increase in the work of the office during the year has necessitated the addition to the working force of one clerk, one laborer, and a messenger.

WORK OF THE YEAR ENDING JUNE 30, 1894.

Publications.—During the year the office issued 24 documents, aggregating 2,089 pages. These included 12 numbers of the Experiment Station Record with a classified table of contents and a detailed index, 6 bulletins, 2 farmers' bulletins, and 4 circulars.

The fifth volume of the Experiment Station Record comprises 1,227 pages, and contains abstracts of 267 bulletins and 43 annual reports of 55 experiment stations in the United States, and 67 publications of the Department of Agriculture. The total number of pages in these publications is 17,161. There are also 227 abstracts of reports of foreign investigations. The total number of titles abstracted is 973, classified as follows: Chemistry, 46; botany, 42; bacteriology, 4; zoology, 6; mineralogy, 1; meteorology, 36; water and soils, 36; fertilizers, 72; field crops, 155; horticulture, 84; forestry, 10; seeds, 16; weeds, 8; diseases of plants, 66; entomology, 74; foods and animal production, 119; veterinary science, 18; dairying, 89; agricultural engineering, 18; technology, 4; and statistics, 69. Classified lists of titles of foreign articles not abstracted are also given in each number. The aggregate number of titles thus reported is 1,514. Special articles contributed by eminent foreign workers in agricultural science were translated in the office and published in the Record, as follows: "Investigations at the

Grignon Agricultural Experiment Station," by Emile Demoussy; "Farm manure," by A. Hébert; "The agricultural experiment station at Halle, Germany," condensed from an account of this station prepared by Dr. K. Bieler and Dr. W. Schneidewind; "Agricultural experiment stations in Belgium," by Dr. A. Petermann; "The experiment station at Bernburg, Germany, and its method of sand culture," by Prof. H. Hellriegel; "Methods of sterilized sand cultures employed at the Bernburg experiment station," by Prof. H. Hellriegel. Similar articles prepared by members of the office force were as follows: "Experiment stations in Holland," by W. O. Atwater; "A review of recent work on dairying," by E. W. Allen; and a condensed account of the "Proceedings of the seventh annual convention of the Association of American Agricultural Colleges and Experiment Stations." The volume also contains a number of editorials on topics deemed of special interest to investigators in agricultural science, and, under the head of experiment station notes, facts regarding the current work of the stations, changes in their working corps, additions to their equipment, new legislation affecting their work, etc.

In the preparation of the Experiment Station Record constant effort has been made to condense the abstracts so far as practicable, and, as a result, they have become increasingly technical as regards their language and form of statement. Care has also been taken in making and revising the mailing lists for this publication, so as to send it only to those who would make the best use of it. The demand for the Record from intelligent farmers has, however, steadily increased, and the number of commendations which it has received from persons without scientific knowledge has been surprisingly large. One thing which undoubtedly has largely increased the demand for this publication has been the fact that it contains information on many topics of interest to farmers which are not treated in other publications of the Department. It is not, however, believed to be wise to make the Record more popular, but rather to confine its distribution more closely to persons of scientific attainments, and to supply in other ways the lack of popular information regarding the methods and results of experiment station work throughout the world.

The Handbook of Experiment Station Work (Bulletin No. 15) is a popular résumé of the publications of the stations during the score of years since their establishment in this country. It consists of several hundred short articles arranged in an alphabetical series, with numerous cross references. This bulletin has been very highly commended by station workers, the agricultural press, and individual farmers. It is much to be regretted that it has been impracticable to meet the demand for the Handbook, since the limited circulation given it has not been commensurate with the labor expended in its preparation or its importance to the agricultural public.

The proceedings of the sixth annual convention of the Association of American Agricultural Colleges and Experiment Stations (Bulletin No. 16) contains, in addition to the routine proceedings of the convention, papers, addresses, and reports on a number of subjects of interest to students and investigators in agricultural science.

Suggestions for the Establishment of Food Laboratories (Bulletin No. 17), by Dr. Edward Atkinson, contains a plea for the establishment of food laboratories in connection with agricultural experiment stations.

The Assimilation of Free Atmospheric Nitrogen by White and Black Mustard (Bulletin No. 18), by J. P. Lotsy, contains an account

of original investigations by the author which indicated that these plants do not assimilate nitrogen from the air, at least in any considerable amounts.

Organization Lists of the Agricultural Experiment Stations and Agricultural Schools and Colleges in the United States (Bulletin No. 19) contains a list of experiment stations in the United States, with their governing boards and working staffs; list of agricultural schools and colleges in the United States, with courses of study and boards of instruction; lists of officers of the Association of American Agricultural Colleges and Experiment Stations and of the Association of Official Agricultural Chemists of the United States; list of station publications received at this office during 1892 and 1893; Federal legislation affecting agricultural colleges and experiment stations; and regulations and rulings of the Post-Office and Treasury Departments affecting the stations.

Fertilizers for Cotton (Farmers' Bulletin No. 14), by Dr. J. M. McBryde, is a popular résumé of investigations carried on by the author during a number of years at the South Carolina experiment station, and has been widely circulated through the cotton-producing States.

Leguminous Plants for Green Manuring and for Feeding (Farmers' Bulletin No. 16), by E. W. Allen, assistant director of this office, contains the practical outcome of experience and investigation on a subject which is of the highest importance to farmers in all sections of our country. One hundred thousand copies of this bulletin have been distributed.

Of the circulars issued during the past year only the following contains information of public interest: Canaigre (Circular No. 25).

Card indexes.—The installments of the card index of experiment station literature thus far sent out include 6,000 cards, of which 3,330 were distributed during the past year. The work on this index in the office has proceeded regularly, but it has not been practicable to secure the printing of cards as rapidly as the manuscript can be furnished, and consequently the work of issuing the cards is still in arrears. The institutions using this index find it so greatly needed, and are so urgent that it should be brought up to date at the earliest practicable time, that it is hoped that nothing will hereafter intervene to delay this enterprise. Congress has granted permission to sell sets of the index at a price covering the expense of printing them. This has been fixed at $1.25 for a set of division blocks and cards, and $2 per thousand for the index cards. About 175 sets are printed for sale, a considerable number of which have already been subscribed for. The receipts from this source during the year were $220.25. Much work is involved in editing, proof reading, sorting, and packing these cards.

The office has recently undertaken the preparation of a card index of the articles by station workers issued in other than station publications. Blank cards for each article are furnished by the office to the authors, who fill them out and return them. They are classified and filed in the office, where they will be available for reference or for future publication. Similar indexes, especially of foreign publications, are in preparation in the office as a necessary part of the routine work involved in the preparation of publications. By this means the office has already obtained ready access to a wide range of information of much use in its correspondence and other work. It is hoped that some way will ultimately be found to extend the benefit of such indexes to the agricultural colleges and experiment stations.

The need of a carefully prepared card index of the publications of the Department is increasingly felt in the work of this office. It is hoped that provision may be made for making such an index in the immediate future. When we consider the elaborate indexing deemed essential in well-equipped newspaper offices, the lack of such labor-saving devices in a Department of the Government created to supply the people with information on all subjects related to agriculture can not easily be justified.

Publications in preparation.—Much labor has been expended during the past year in preparing publications not yet issued. These include bulletins on the History, Cultivation, and Uses of the Cotton Plant; The Chemistry and Economy of Food; Barnyard Manure; The Culture and Uses of Peanuts, and Sweet Potatoes.

The bulletin on the cotton plant will include chapters on the history, botany, chemistry, soils, manuring, culture, diseases, injurious insects, and uses of products. The purpose is to present a condensed statement of scientific and practical knowledge regarding this plant and its uses from an agricultural standpoint, with a view to showing what still needs to be done to improve varieties or methods of culture, or to more completely and economically utilize the products of this plant. It is hoped that this work will form the basis of important investigations at the experiment stations and elsewhere.

Investigations regarding the nutritive value and digestibility of different products used as human foods have been carried on for a number of years, for the most part in Germany. Lately, research in this line has been begun in this country, especially by Prof. W. O. Atwater, at Wesleyan University. This work has been aided to a considerable extent by the National Government through the Fish Commission and the Department of Labor, and also by the authorities of the World's Columbian Exposition. The Storrs Experiment Station of Connecticut has taken an important part in these inquiries. Very much work is, however, required to complete the investigations and to make their results of practical benefit to the people. It seems desirable that such investigations should be carried on parallel to the researches now in progress at the agricultural experiment stations, to which they are closely related. With this object in view a request for an appropriation for food investigations was included in the estimates of the Secretary of Agriculture for the expenses of this Department for the current fiscal year, and the amount asked for was granted by Congress for that purpose. As an almost necessary preliminary to further work in this line in this country, this office was directed to prepare a résumé of methods and results of investigations on the chemistry and economy of food, which might be a handbook of information on this subject for the use of investigators and students. This work was put in charge of Professor Atwater, in connection with his other duties as special agent of the Department assigned to this office. The manuscript of this bulletin is now about ready for the printer. Besides the material included in this bulletin, much information which will hereafter be of great service in connection with food investigations has been collated, and the way has been prepared for the issuing of popular bulletins which will bring the practical results of food investigations to the attention of the public.

Popular record of experiment station work.—There is still need for the more thorough dissemination of the practical information obtained at the experiment stations in the several States in popular form to the farmers throughout the country. Until this is done the people at large

will not secure the greatest benefits from the work of all the stations, to which they contribute in common from the National Treasury, and the stations in the different States will be hampered by demands for work which has already been sufficiently carried on in other places. The means at the disposal of the office heretofore have not been sufficient to enable it to undertake the preparation of popular accounts of experiment station work to that extent which is desirable, but it is hoped it will before long be given the opportunity to satisfy just demands in this direction.

World's Fair work.—During two months of the past fiscal year a representative of this office was on duty at the cooperative exhibit of agricultural colleges and experiment stations at the World's Columbian Exposition, and considerable time has necessarily been devoted during the year to correspondence connected with this exhibit and to the preparation of reports.

Association of American Agricultural Colleges and Experiment Stations.—The director of this office was a delegate to the seventh annual convention of this association, held at Chicago on October 17–19. The stenographic report of the proceedings was prepared under his direction, and has since been edited by him and the chairman of the executive committee of the association, and issued as Bulletin No. 20 of this office. A notable feature of this meeting was a lecture given by Sir Henry Gilbert, of Rothamsted, England, under the provisions of the Lawes Agricultural Trust, under which the results obtained by the Rothamsted station are to be brought to the attention of the American people once in two years. This lecture was introductory to a course of lectures afterwards delivered at the Massachusetts Agricultural College, in which the investigations carried on at Rothamsted for fifty years under the direction of Sir John B. Lawes and Sir Henry Gilbert were concisely explained. These lectures bring together in compact form much useful information, and it is hoped that a way may be found to publish them for the benefit of American agriculture.

Bibliographical work.—On the appointment of a bibliographer, October 1, 1893, the library of the office, which had outgrown the single room in which it was kept, was rearranged, the foreign publications being moved to the adjoining room. During the nine months ending June 30, 1894, there were added to this library 1,140 books and pamphlets, very largely the publications of American and foreign experiment stations, making a total of 6,066. All publications received were acknowledged, stamped, recorded, and catalogued. Many duplicates of station and other publications were received, and in answer to requests a considerable number of these were sent to colleges, stations, station workers, and others. About 1,700 numbers of periodicals were received from the general library of the Department or from other sources, which were recorded, distributed to the different members of office force requiring them, and returned to their proper depositories.

A list of recently published books on agricultural topics was prepared from notices in periodicals and from catalogues of various publishers in this country and abroad.

The libraries of Washington City have been examined with reference to the publications relating to agricultural science which they contain, and lists have been made up of the agricultural and scientific periodicals on file or regularly received by these libraries. It is hoped that it may be practicable to extend this work to libraries in other parts of the country, and ultimately to so thoroughly ascertain the location of works

of importance to investigators and students in agricultural science that the office will be able to render material assistance to those desiring to make special studies by giving them information which will enable them to get ready access to the literature of the subjects they intend to pursue. In its bibliographical work this office has received the cordial assistance of the librarian of the Department and has only attempted to supplement his work in lines suggested by the peculiar needs of the various tasks in which the office is engaged.

Arrangements have been partially made for enabling the colleges and stations to complete their files of station publications by exchanges and donations effected through this office.

Through the generosity of Sir J. B. Lawes and Sir Henry Gilbert 800 copies of Memoranda of Experiments at Rothamsted during Fifty Years were received and distributed to station workers and governing boards.

Collection of the statistics of agricultural science and education.—During the past year, as heretofore, the general statistics relating to the organization, revenue, lines of work, courses of instruction, etc., of the agricultural colleges and experiment stations in this country have been collated and published. Something has also been done in the way of collating such information regarding foreign institutions. It is believed that more systematic and thorough work in this direction would be useful.

Mailing lists.—This office has two separate mailing lists, one containing about 5,500 addresses to which the Experiment Station Record is regularly sent, and another of some 45,000 addresses to which farmers' bulletins are sent. During the past year, as heretofore, the office has taken great pains to make up and revise its mailing lists, so as to insure the distribution of its publications to those who make good use of them. As the publications of the office are very largely works of reference and treat a wide range of subjects, there is a growing demand for complete sets of these publications. It is very desirable that a certain number of sets, especially of the Experiment Station Record, should be held in reserve to meet future requests from institutions for research and education and individual investigators.

Seed distribution.—With a view to securing more thorough tests of new and rare varieties of seeds, the experiment stations were invited to send in requests for seeds for their own use and for a limited number of farmers who would make the tests under their direction. Owing to the fact that this plan was not matured until after the purchases of seed by the Department for the season had been made, it was not practicable to fully satisfy the demands which were made by the stations. However, seeds of a number of varieties of forage plants and vegetables were sent to 40 stations and about 3,000 farmers. It is expected to continue this distribution another season, and in this way the Department hopes to be able to obtain satisfactory tests and reports on the varieties of seeds which it undertakes to introduce in various localities.

Correspondence.—During the past year the office received 15,119 letters and sent out 15,743 letters, as compared with 8,104 received and 10,526 sent during the previous year. The number of packages received last year was 7,197 and the number sent 14,982. Franks were also written for a farmers' bulletin list aggregating over 45,000 addresses. A subject index of the office correspondence has been begun. The work of the office as a bureau of information on a great variety of agricultural subjects has assumed large proportions and many of the replies

necessitated by the inquiries of its correspondents consume much time and study in their preparation. Under the method of indexing now pursued such letters are readily available in case the same subjects have to be treated again.

Reports of the colleges having courses in agriculture.—The financial and statistical reports of the colleges receiving appropriations under the act of Congress of August 30, 1890, for the fiscal year ending June 30 1894, as deposited in this office, show that instruction in agriculture has been generally provided for in these institutions, and that the facilities for such instruction have been increased during the past year. As far as reorganization of courses of instruction is reported it has invariably been in the direction of more strictly industrial education. One interesting feature of this movement is the increased attention being paid to instruction in the theory and practice of agriculture in the institutions for colored students.

Supervision of expenditures of experiment stations.—In accordance with the recommendation of the Secretary of Agriculture in his Annual Report for 1893, the act of Congress making appropriations for this Department for the present fiscal year contains the following clause: "And the Secretary of Agriculture shall prescribe the form of the annual financial statement required by section three of the said act of March second, eighteen hundred and eighty-seven; shall ascertain whether the expenditures under the appropriation hereby made are in accordance with the provisions of the said act, and shall make report thereon to Congress."

The schedules required by this act have already been prepared and published. It is expected that considerable additional labor will be imposed upon this office in the discharge of duties growing out of this new requirement of the law governing the relations of the stations with this Department.

INVESTIGATIONS REGARDING THE NUTRITIVE VALUE AND THE ECONOMY OF FOODS.

Following the recommendation of the Secretary in his Annual Report for 1893 (p. 33), Congress inserted the following clause in the act making appropriations for this Department for the present fiscal year:

> To enable the Secretary of Agriculture to investigate and report upon the nutritive value of the various articles and commodities used for human food, with special suggestion of full, wholesome, and edible rations less wasteful and more economical than those in common use, ten thousand dollars; and the agricultural experiment stations are hereby authorized to cooperate with the Secretary of Agriculture in carrying out said investigations in such manner and to such extent as may be warranted by a due regard to the varying conditions and needs of the respective States or Territories, and as may be mutually agreed upon; and the Secretary of Agriculture is hereby authorized to require said stations to report to him the results of any such investigations which they may carry out, whether in cooperation with said Secretary of Agriculture or otherwise.

By order of the Secretary, the supervision of the work on food investigations has been assigned to this office. Prof. W. O. Atwater has been appointed special agent to take charge of these investigations. As stated above, a bulletin giving a résumé of such investigations in this country and abroad was prepared in this office during the past year. This bulletin is intended primarily as a handbook, to be used in prosecuting further investigations, as provided for by Congress.

The work undertaken and planned for the present fiscal year includes—

(1) Studies of the composition, nutritive value, and cost of food

materials in several places in the Eastern, Southern, Central, and Western States. The special object of these inquiries is to find what food materials people actually buy, how much they pay for them, what nutriment they contain, and what is the relation between the actual nutriment and the cost.

(2) Studies of actual dietaries, with a view to learning what are the kinds and amounts of food materials actually consumed by people in different places, of different classes, and under different conditions.

(3) Studies on the digestibility of foods.

(4) Improvement of methods of investigation. Scientific researches regarding human foods have only recently been conducted in a thorough manner and much needs to be done to make the methods of investigation more exact and satisfactory.

(5) Experimental inquiries regarding ways in which food is used in the body, or, in other words, a study of the laws of nutrition of man. On this subject there are many theories, but comparatively little exact information. Thorough research in this line will require much time and effort, and will be comparatively costly, but until the needed investigations are made many of the conclusions regarding the nutritive value and digestibility of different foods will not rest upon a sure basis of ascertained facts. With the means now at the disposal of the Department little more can be done than to mark out the paths for such investigations.

(6) Compilation of results of inquiries on foods conducted in this country and abroad. This is of fundamental importance, both for the investigators and institutions through whom the needed investigations are to be made, and for the use of the general public.

(7) Preparation of publications. These are to be of two classes, one intended more especially for students and investigators, the other for the general public.

The policy thus far adopted has been to have part of the work done under the immediate supervision of the Department and to distribute the rest among the experiment stations, colleges, and other organizations in different parts of the country. The purpose is to take advantage of the facilities for this work already existing in different institutions and to supplement these with financial support, which will secure the employment of competent workers and bring the greatest results from the investigations, with the widest economy in the use of public funds. There is every reason to believe that a sufficient number of institutions will be found to cordially cooperate with the Department in the investigations of this kind.

In the prosecution of this work the fundamental idea will be to learn as much as practicable of the food economy of our people and the ways for its improvement. The importance of this subject is manifest when we consider that half of the earnings of the wage workers of the civilized world are expended for food; that the health and strength of all our people depend largely upon their nourishment, and that the nature of different food materials, the kinds and amounts of actual nutriment they contain, the ways in which the nutritive materials nourish the body, the proportions of such materials which are best fitted for the nourishment of people of different ages, sex, and occupations, and the relations between nutritive value of food and its cost, are but little understood even by the most intelligent. It is evident that few subjects of investigation are so wide reaching in their importance, or come so close home to every individual and household of the land. All that is now possible is to make a beginning, to find out what needs to be

done and how it is best to do it, and to get some of the investigations started.

Besides the handbook on investigations of the chemistry and economy of food above referred to, the following publications are now in course of preparation:

(1) A series of popular bulletins on food economy. These are to explain concisely and clearly the practical results of investigations relating to food materials and their proper use. They will treat of such subjects as the nutritive ingredients of food, the digestibility of food, effects of cooking on digestibility, combinations of food materials appropriate to different classes and occupations, food as related to health, the nutritive value of food as related to its cost, waste of food, etc. They will be illustrated by diagrams, and great pains will be taken to make them intelligible and useful to the public. These popular bulletins will be supplemented by colored charts illustrating the composition and economy of food. It is hoped to make these charts so clear and simple that they will be found useful in schools and other institutions in connection with instruction in food economy and hygiene. Similar charts made for the World's Columbian Exposition attracted considerable attention, and newspaper notices of the intended publication of such charts by this Department have already created quite a demand for them in advance of their publication.

(2) A compilation of experimental inquiries regarding the food and nutrition of man. This is intended to cover the ground of such inquiries more thoroughly than has hitherto been done in the English language.

REPORT OF THE CHIEF OF THE DIVISION OF FORESTRY.

SIR: I have the honor to submit my ninth annual report upon the work of the Division of Forestry, together with propositions and estimates for future work, as required by your instructions under date July 27, 1894.

Very respectfully,

B. E. FERNOW,
Chief.

Hon. J. STERLING MORTON,
Secretary.

FUNCTIONS OF THE DIVISION OF FORESTRY IN GENERAL.

In view of frequent misconceptions on the part of the public and the press as to the functions of this division, it may be proper to emphasize again the fact that the work of the Division of Forestry is in nowise of an executive character. It has nothing to do with the management of the forests on the public domain, or the recently established public forest reservations; it has not even an advisory position with reference to them, being instituted to preach, not to practice, thus exhibiting the incongruous condition of the Government advising the people without applying its own advice to its own property. At present the functions of this division are covered by the vague language of the act appropriating for it as follows:

> To enable the Secretary of Agriculture to experiment and continue an investigation and report on the subject of forestry and timbers, for traveling and other expenses in the investigations, and for the collection and distribution of valuable economic tree seeds.

It is, then, a bureau of information, like most of the other divisions in the Department of Agriculture. The inquiries which are referred to it comprise all subjects which have reference to forests and forest materials from the botanical, cultural, and economic point of view, and as in this country the various branches of arboriculture are not yet fully specialized, questions of street and roadside planting and landscape gardening are also not infrequently, though improperly, considered as subjects for its discussion.

The subjects of inquiry from correspondents which found answer during the year can be classed as statistical, referring to forest supplies and consumption, markets, imports, and exports; as technological, referring to methods of using wood materials, their qualities, durability, means of preserving, and to by-products; as botanical, referring to description, manner of growth, adaptation to various localities; as technical forestry, questions such as refer to methods of planting and managing forest crops, under various local conditions, kinds to be used,

where to be had, collecting and keeping of seeds, protection against insects, fires, fungus; as miscellaneous, requiring answer to questions of conditions of forestry here and abroad, Government policy, forest legislation, forest influences, literature, etc. To supply the information it is necessary to study the current literature of this and other countries, to collect and classify the study material, to correspond with persons who are in position to furnish specific information, and to institute special inquiries and experiments. The results of these latter are usually reported in circulars of information, bulletins, and annual reports. A list of the publications from this division never having been printed before, is submitted herewith as an appendix.

In the way of field experiments the division has as yet only a short record, a small forest-planting experiment in Nebraska being the only attempt at such work. The reason for deficiency in this respect was, in the first place, lack of funds; in the second place, since experiments in forestry proper naturally presuppose field work, either the planting or the managing of forests, the absence of all facilities in the shape of grounds or growths precluded any attempts in that direction. Furthermore, forest experiments give their answer only in years, and hitherto the encouragement to begin any experiments of long duration and without immediate results has been absent. Laboratory experiments seemed, therefore, more promising, and hence the institution of the now well-established timber-physics work.

In the laboratory the comprehensive line of timber-test work and biological investigations begun three years ago have been most prominent.

WORK OF THE YEAR.

OFFICE WORK.

The correspondence has continued to increase beyond that of former years, filling 1,692 pages of letter book to 1,274 correspondents. This correspondence, with the exception of routine letters, is mostly attended to by the writer with the assistance of the two experts in the division where such is necessary.

Since the timber-test work has become well established a large amount of time is consumed in its direction and the correspondence has grown also in that direction. Requests for determining the kind and character of timbers when disputes arise between mill man and consumer have become frequent and give a new value to the expert work of the division.

PUBLICATIONS.

Although a large amount of material has accumulated before and during the year, it has been impossible with other current duties to prepare the same for the printer, so that with the exception of some reprints, notably Bulletin No. 4, on the Substitution of Metal for Wood in Railroad Construction, and Bulletin No. 6, of the Timber Physics series, no new publications have been issued for 1894.

A number of reports now in manuscript remain still unpublished, requiring only the finishing editorial preparation, or are in course of perfecting and are expected to be brought out during the coming year.

BOTANICAL AND MUSEUM WORK.

The manuscript on the Revision of Nomenclature of the Arborescent Flora has been entirely reviewed and brought down to date, and will be ready for publication presently.

The study material in the herbarium has been increased by some 400 specimens collected incidentally by the botanist and agents of the division.

The return of materials from the World's Fair made it necessary to install the same in the Museum, as well as to rearrange and classify the material on hand.

Duplicates of wood specimens were cut into suitable shape for hand collections and a number of these, properly identified were distributed to educational institutions. This work occupied considerable time of the botanist, who also spent three months superintending the exhibit of the division at Chicago and its return. Some time was spent by him in preparing material for illustrating the monographs on conifers and in the propagation and care of seedlings of Western conifers, some twenty-five kinds, which were planted with a view to testing their adaptability to this climate. This collection is now in promising condition and can be utilized next season in the open. The seedlings of the Monterey pine (*Pinus insignis*) from California have stood two winters and show a fair annual growth.

SEED AND PLANT DISTRIBUTION.

Some 5,000 black-walnut seedlings, grown by the Maryland Agricultural Experiment Station for the Department, were distributed to 400 correspondents, and 4,000 cuttings of superior basket osiers, grown in the Department grounds, were sent to 300 applicants. No other seed or plant distribution was attempted. As explained repeatedly in my former reports, the usefulness of expenditures in this direction has been rather questionable.

TIMBER INVESTIGATIONS.

As in the two preceding years, the largest share of the work done by the division and of the expenditures has been devoted to a continuance of the investigations, designated under the term of "timber physics." The object of this comprehensive undertaking is to acquire a thorough knowledge of the wood materials of the United States, for the purpose of enabling the users of wood to apply the same most efficiently and most economically, determining the most suitable use of each species, the best manner of its use and the amount of service to be expected from the same, and also for the purpose of enabling the wood producer to judge what kind of material and under what conditions he can produce the same. This knowledge thus becomes "the pivotal science of the art of forestry, around which the practice both of consumer and producer of forest growth moves." The work is now carried on in three departments, the collecting, the testing and the physical examination.

COLLECTION.

The collection of examination materials requires the services of expert botanists. They have been carried on as before most efficiently by Dr. Charles Mohr. They have been confined to southern localities, namely, the various pines from sites in Alabama and Georgia; cypress from uplands and lowlands in Florida, Mississippi, and Louisiana; oaks, hickories, elms, ash in Mississippi and Arkansas. Altogether material from 244 trees, representing 24 species on 13 different sites, was collected, furnishing 20 car loads of logs to the mechanical laboratory at St. Louis and over 1,200 corresponding disks to the physical laboratory at Washington.

The transportation of the car-load material as well as of the collector was mostly given free of charge by the railroad companies, and the thanks of the Department are especially due to the St. Louis Terminal Railway Company as also the Louisville and Nashville, the Illinois Central and East Tennessee, Virginia and Georgia Railroad (now Southern Railroad), as well as to various owners of timber lands, for free gift of material and accommodation in its haulage and shipment. Lately, however, the railroad companies have declined to extend the favors, and in future the cost of transportation will have to be borne by the Department. In addition some collections of spruce, poplar, and white pine were made in Maine, New Hampshire, Massachusetts, and Michigan.

PHYSICAL LABORATORY.

The work of the physical laboratory has been in charge of Mr. Filibert Roth with only one assistant and in most unsuitable quarters. Here the material subjected to tests is examined and its physical condition and anatomical structure studied, requiring an endless amount of careful and painstaking weighings, measurings, countings, computings, microscopic examinations and drawings, and recording of the observed facts in such a manner that they can be used in comparison with the results of the test laboratory. Mr. Roth has continued the physical and anatomical examination of the test material, previously collected, of 234 trees and also examined the new material as it came in and required immediate attention, such as shaping the same for use, determining its fresh weight, volumetric measurements, its growth conditions, etc.

In addition special investigations were conducted on the swelling and shrinking of wood, and a study of the methods of artificial wood seasoning, including a canvass among users and manufacturers of dry kilns, was begun. A preliminary report (not yet published) on the physical properties and anatomy of long-leaf pine (*Pinus palustris*), based on the study of 43 trees, was prepared.

In connection with this work and in cooperation with the Chemical Division, the investigations into the distribution of resins in fresh sapwood were continued, with the result that no difference could be found between fresh and dry wood, showing that no deterioration due to loss of turpentine is experienced in the sapwood. This investigation, besides furnishing necessary physiological facts, was planned to furnish the basis for improvements in the practice of turpentine orchards. Mr. Carr, of the Chemical Division, also assisted in the dry-kiln investigation by conducting a series of experiments into the effect of air of different temperatures and relative humidity upon the process of drying.

Most of the work on tannins reported in my last report as for the calendar year also fell into the first part of the fiscal year. It had to be abandoned for the present, the chemist in charge of it being needed on other work.

In cooperation with the Division of Vegetable Pathology an investigation into the causes of blueing of timber, experienced especially in the sappy pines of the South, was instituted with a view of devising remedies.

The experiments to determine the relative inflammability and combustibility of various timbers contemplated in my last report have not as yet been carried out, owing to delays in arrival of the test material and the inadequacy of facilities, as well as multiplicity of other duties requiring immediate attention.

MECHANICAL LABORATORY.

In the mechanical or test laboratory not only the coefficients of strength (a necessary knowledge for engineers and builders) and other mechanical and working properties of the commercial timbers in general are established, but the data are furnished for discussing the relation of these properties to other conditions, as the site on which the timber was grown, its anatomical structure, its position in different parts of the tree, the influence of moisture and of other factors and circumstances upon the strength.

As I have pointed out elsewhere, this work as carried on by the Forestry Division differs from all test work hitherto undertaken, not only in the large number of tests on the same species, and in the use of material which is thoroughly known as to its condition and history, but also in permitting a correlation of the physical structural properties and growth conditions with the mechanical properties, thus leading to the possibility of specifying wood materials with precision, just as iron, steel, etc., is specified in structures.

The test work has been carried on as last year under special contract with Prof. J. B. Johnson, at the Washington University of St. Louis, at a set price per test, $10,000 being devoted to this part of the work. Up to the end of the fiscal year 24,000 tests on 4,000 specimens, tested for six different properties, had been made on 233 trees, embracing 23 different species, namely, 130 trees of various species of pine, 60 trees of various oaks, 19 trees of cypress, and 24 of miscellaneous hard woods.

The examination of the mechanical properties of the longleaf, shortleaf, and loblolly pines of the South has been quite thorough, and after the material still on hand has been subjected to test, at least the coefficients of strength for these species may be considered reliably established. I can not refrain from pointing out here some of the more immediately tangible values of this work.

The demonstration, that bled longleaf pine is in no way inferior to unbled timber, has been estimated, by appreciation of the price of bled timber and by the possibility of bleeding all timber, to add at least $2,000,000 of value to the annual pine product of the South. The establishment of the further fact, by the very large number of tests, that the factor of safety for structures such as bridges, trestles, and roof trusses with longleaf pine may be reduced by one-third (or from about 10 to 6) makes a saving of 25 per cent of material possible. To translate this saving into money value we may assume that of the 2,500,000 M feet of longleaf pine lumber about 2,000,000 M feet go into structural work, and placing the price at $12 per M feet, a saving of 25 per cent on this amount represents a saving of $6,000,000. So that in three years these investigations have, with an expenditure of less than $30,000, produced results in tangible money value which can be fairly estimated at $8,000,000, besides a vast accumulation of data equally promising of practical results. And these results have been attained in spite of deficient facilities and methods, as I shall point out further on.

TREE MEASUREMENTS AND ACRE YIELD DETERMINATIONS.

According to the plan reported last year a series of measurements of the rate of growth of the spruce in virgin forests of Maine and New Hampshire, and of the second growth white pine in New Hampshire, Maine, and Massachusetts have been made, there being now on

record 543 tree analyses and 44 acre yields, of which latter 21 have reference to second growth white pine areas. With the knowledge established by these measurements it will be possible to discuss the rate of growth and production of the various species, and on the basis of it to speak intelligently of the profits that might be derived from forest management. This knowledge has been up to the present sadly deficient.

PROPAGANDA WORK.

There is still a need for this division—as was no doubt the intention of the law in establishing the same that it should do—to simply popularize forestry ideas. In addition, therefore, to the publications which have this object in view, the writer has attended such public meetings as promised opportunity by word of mouth and subsequent press report to aid private endeavor in that direction.

During the first two months of the year the writer was engaged on the jury of awards at Chicago and during this time participated in the "Foresty talks" instituted by the World's Fair managers. In October the World's Fair Forestry Congress was attended by him, for which he had prepared several papers. At the annual meeting of the American Forestry Association the writer delivered an illustrated lecture on "The battle of the forest," showing the gradual evolution of forest growth, the changes which take place in it owing to natural and human agencies, and the baneful effects of deforestation. This lecture was repeated at Albany, N. Y., before a special forestry meeting, before the students at the agricultural colleges at Amherst, Mass., and Kingston, R. I., and upon special invitation before the Royal Society of Canada. Leave of absence was granted the writer for the purpose of delivering a course of twelve lectures on technical forestry before a class of 50 students at the Amherst Agricultural College. Various addresses were also prepared for various societies when office duties prevented the personal appearance of a representative.

It is hoped that early in the next session of Congress the bill (S. 313) appropriating funds specially for the continuance of the timber test work, passed by the Senate and favorably reported to the House by the Committee on Agriculture, may become a law, thus permitting a reapportionment, to the advantage of the tree measurements, the experimental plantings, and the employment of assistants to prepare for publication the data and reports which have accumulated, some of the data having waited five and six years, their publication having been announced from year to year and delayed again and again on account of the mechanical impossibility on the part of the writer to give the necessary attention to their editorial revision, with the press of other duties and lack of assistance. It is proposed, if this relief is forthcoming, to issue during the year the following reports:

1. Report on wood seasoning.
2. Progress report in timber physics, to contain the accumulated data on all Southern pines.
3. Biological monographs on the Southern pines and other conifers.
4. Revision of the nomenclature of the arborescent flora.
6. The trees of Washington.
7. Additional report on the substitution of metal for wood in railroad construction.
8. Report on the consumption of wood in the charcoal iron industry and other technological papers.

9. Results of tree measurements.

10. "How to make wood durable," Farmers' Bulletin.

11. A timber primer, or brief outline of the technical properties of wood.

12. A foresters' primer, or advice to farmers on how to start and manage a timber crop.

The following special investigations in the line of timber physics are contemplated, or begun, in addition to the routine work in accumulating data: Special study of the relation of moisture to strength; of the relation of size to strength, especially of columns; of the distribution of strength in the tree horizontally and vertically; of the relation of moisture to specific gravity.

It is hoped to finish the physical study of the material so far collected for the preparation of a preliminary report on the physical properties and rate of growth of the conifers and oaks, to carry out the investigation into the inflammability and combustibility of our principal construction timbers, to begin a study of the comparative structure of our oaks and some other group of deciduous trees, and some field experiments in improved turpentine orcharding.

The tree measurements are to be made mainly of white pine, red pine, and hard woods in Michigan, Wisconsin, and Minnesota.

The botanist is expected to devote his time mainly in assisting the editorial work on the publications which have reference to his branch, and to begin the preparation of a handbook of the arborescent flora, designed for laymen and practitioners.

PROPOSITIONS FOR THE FISCAL YEAR ENDING JUNE 30, 1896.

This division grew slowly for a time from small beginnings, but more rapidly during the last four years. From a mere agency for the purpose of publishing reports on forestry in general, with a view of making propaganda for a more rational treatment of our forest areas and popularizing forestry principles, it has, by the exploitation of our forest resources, become the recognized Government representative of the interests of industries which produce annual values of over one billion dollars. As such, even before an actual application of forestry principles to our woodlands and a commercial extension of our forest areas may take place, the work of the division can be profitably extended, to the advantage of these industries and the country at large.

With our waning virgin supplies, not only is it desirable to study and promulgate all possible economies in the use of wood materials, but it can be a question of a short time only when forestry—the systematic growing of timber crops—in this country will become a well-established business—as well established as agriculture and coextensive with it; when a knowledge, not only of the forestry principles developed by other nations through long experience, but also of facts and figures, gathered on our own soil from our own forests, necessary for the practical, technical, and commercial application of those principles, will be needed. This knowledge should be gathered now with all due diligence, in order that it may be available when required. There are three main directions in which this knowledge must be sought, namely: Forest statistics, which furnish the basis for the economic and commercial development of our forest resources; forest biology, which furnishes the basis for the technical management of forest crops, and forest technology, which teaches the proper use of the wood crop in the arts.

Since the division began original work the last of these three branches has been made most prominent in the timber physics work, because at the present stage of our development it seemed to be most needful and promised most immediate practical results. But the other two directions should not be neglected any longer. Provision should be made for an extension of the biological work, consisting in a study of the life history and behavior of our principal timbers, their rate of growth, their adaptation for forestry purposes, and requirements as to soil, climate, and treatment. While this study is mainly a matter of field-work and observation in the woods, it should be supplemented by trial plantations; and since forest planting has become one of the recognized necessities of farm culture in the western forestless plains, such trial plantations should be especially made in those regions in order to establish object lessons as to proper selection and use of plant materials, methods of planting, and methods of after management.

Statistical inquiry is preeminently a government function, because no private agency can satisfactorily accomplish it; and its results—knowledge of the condition of the country—benefit the whole community. Yet in this direction the Government has been most neglectful, as far as forestry statistics are concerned, although it would seem highly desirable to ascertain the condition of a resource which yields raw material of a value not less than one-quarter of the value of all raw materials used in this country, and which, while capable of being kept ever-producing, requires timely attention, since it takes a hundred years and more to produce serviceable supplies.

By rough estimates, based upon partial statistics and the substitution of possibilities and uncertain probabilities for unascertained actualities, the writer has shown in last year's report that, with a consumption of probably 24,000,000,000 cubic feet of wood from a forest area of 466,000,000 acres, culled and cut without any regard to reproduction, we are cutting to the extent of 75 per cent into our forest capital beyond the annual reproduction, and will have exhausted our supplies long before a new crop can be grown, unless immediate attention is paid to it. If this be a correct statement (and I know of no reasonable doubt as to the general truth of the calculations), it would appear highly desirable to have more positive knowledge regarding these conditions, and to establish beyond controversy the facts underlying the estimates. The hopelessness of accomplishing such a task with the slender means at the disposal of the division and an aversion to adding only further partial or unreliable data to our knowledge of the subject have deterred the division from entering this field altogether, on the belief that unless thoroughly done it is not worth doing at all. In addition, it should not be overlooked that forestry statistics can not be gathered in the same manner and by the same methods as other vital or agricultural statistics.

While forest consumption may be ascertained by established methods, forest supplies can not be counted like "hogs, dogs, or logs." While forest areas may be estimated or measured by any intelligent person, what the area promises to yield for the present or the future can be stated only by an expert; hence, it becomes necessary to have the means and methods of ascertainment devised and the canvass supervised by an expert who combines the skill of the statistician with the expert knowledge of the woodman.

I recommend, therefore, that if the collection of these statistics is deemed as important and desirable as the writer believes it to be, such a man be first employed to work up a practicable method, ascertain

the cost of the work, and submit the plans for further consideration and action in the appropriations.

Meanwhile, the timber physics work, promising most immediate results of highly practical value, should be pushed. In order to do this satisfactorily, the first needs are better accommodations for the physical laboratory work. The present quarters are not only unsuitable, but are a disgrace to the Government. The second floor of a wooden shed is in imminent danger of breaking down under the increasing load of the accumulating material; is liable to burn down at any time with a collection which can not be replaced, and which, by reason of the work of investigation performed on it, is worth thousands of dollars; is too hot in summer and too cold in winter for working with comfort, endangering the health and safety of the workers, and without adequate facilities for the work. Such conditions, it must be admitted, are not promotive of the best progress of the work, nor does this penuriousness lead to economy.

While the bulk of the testing will be carried on at the St. Louis laboratory, the finer test work for correlation will finally have to be performed here at the physical laboratory, and provision for proper accommodations and apparatus becomes imperative. Since all the material collected must remain for long periods under constant control and accessible to the experimenters, and since constant additions require enlarged space, I recommend that there be provided accommodations in a strong fireproof building to the extent of at least 2,000 square feet floor space, where also, besides light for microscopic work and heat for drying ovens, power for a test machine, saw, planer, etc., can be had.

An addition to the expert force in the physical examination becomes necessary also, in order to keep pace with the progress of the test work, in the person of one plant physiologist, versed in histological and anatomical work.

APPENDIX.

PUBLICATIONS OF THE DIVISION OF FORESTRY.

Report on Forestry, by Franklin B. Hough, 1878, 650 pp. Out of print.

Report on Forestry, by Franklin B. Hough. Vol. II, 1880, 605 pp. Out of print.

Report on Forestry, by Franklin B. Hough. Vol. III, 1882, 318 pp. Out of print.

Report on Forestry, by N. H. Egleston. Vol. IV, 1884, 421 pp. Out of print.

Annual Report of the Chief of the Division of Forestry for 1886, by B. E. Fernow, 77 pp. Out of print.

Annual Report of the Chief of the Division of Forestry for 1887, by B. E. Fernow, 156 pp. Out of print.

Annual Report of the Chief of the Division of Forestry for 1888, by B. E. Fernow, 64 pp. Out of print.

Annual Report of the Chief of the Division of Forestry for 1889, by B. E. Fernow, 54 pp. Out of print.

Annual Report of the Chief of the Division of Forestry for 1890, by B. E. Fernow, 43 pp; containing besides general discussions, papers on the wood-pulp industry and on artificial rainfall.

Annual Report of the Chief of the Division of Forestry for 1891, by B. E. Fernow, 38 pp; contains paper on Southern pines, on forest planting experiments, on bamboo, and poisoning of street trees.

Annual Report of the Chief of the Division of Forestry for 1892, by B. E. Fernow, 65 pp; contains papers on the general situation of forestry in the United States, on management of Chickamauga National Park and on naval store industry.

Annual Report of the Chief of the Division of Forestry for 1893, by B. E. Fernow; contains papers on consumption and supply of forest products in the United States and on German forest management.

Bulletin No. 1, 1887, 149 pp. Relation of Railroads to Forest Supplies; containing chapters on wood preservation and metal ties.

Bulletin No. 2, 1888, 252 pp. Forest Conditions of the Rocky Mountains; containing discussions on the Government in its relation to forests, on the forest flora of the Rocky Mountains of San Diego, on the climate of Colorado, on snow slides and avalanches—their formation and prevention, etc.

Bulletin No. 3, 1889, 79 pp. Metal Track, etc. Out of print.

Bulletin No. 4, 1890, 359 pp. Substitution of Metal for Wood in Railroad Construction, with a discussion on consumption of forest supplies by railroads and practicable economies in their use.

Bulletin No. 5, 1891, 51 pp. "What is Forestry?" being a discussion of the principles underlying forest planting and forest management.

Bulletin No. 6, 1892, 57 pp. Timber Physics, Part I. Plan and explanation of the work of timber investigations and historical review of former work in that direction.

Bulletin No. 7, 1893, 197 pp. Forest Influences; being a review of the observations of the influence of forests on climate, water flow, and health, and allied papers.

Bulletin No. 8, 1893, 92 pp. Timber Physics, Part II. Test work on long-leaf pine, characteristics and distribution of the species, influence of turpentine orcharding on its quality, and distribution of resinous contents.

CIRCULARS OF INFORMATION.

To Educators for Cooperation. 1886.

To Educational Men. 1887.

Increasing the Durability of Timber. 1887.

For Information of Railroad Managers. 1887.

Arbor Day in the Eastern States. 1889.

Instructions for Growing Tree Seedlings. 1890.

The Government Timber Tests. 1891.

Strength of Boxed or Turpentine Timber. 1892.

Effect of Turpentine Gathering on the Timber of Longleaf Pine. 1893.

Suggestions to the Lumbermen of the United States in Behalf of More Rational Forest Management. 1893.

Letter to the Secretary of Agriculture regarding forest growth and timber consumption in the United States. (Answer to Mr. Gannett's article in Evening News, April 1, 1893.) 1893.

REPORT OF THE CHIEF OF THE DIVISION OF VEGETABLE PATHOLOGY.

SIR: In compliance with the order of the Secretary of Agriculture, dated July 27, 1894, I have the honor to submit herewith a report embodying the following:

(1) A synopsis of the work of this division for the fiscal year ending June 30, 1894.

(2) An outline of the work planned for the current fiscal year.

(3) Recommendations in regard to the work of the division.

Respectfully,

B. T. GALLOWAY,
Chief.

Hon. CHAS. W. DABNEY, JR.,
Assistant Secretary.

WORK OF THE DIVISION FOR THE FISCAL YEAR ENDING JUNE 30, 1894.

Under the foregoing head the subjects discussed may be divided as follows:

1. Laboratory investigations.
2. Field work.
3. Routine office work, including preparation and publication of reports, bulletins, and circulars; care of correspondence; herbarium work; indexing literature, etc.

1. LABORATORY INVESTIGATIONS.

Work in the laboratory was carried on during the year at Washington, D. C., Eustis, Fla., and Santa Ana, Cal., the more important subjects studied being the growth of potatoes as affected by spraying with Bordeaux mixture; pear blight; rusts and other diseases of cereals; melon diseases, especially those prevailing in the South; blight, die back, sooty mold, and scab of the orange and other citrus fruits; the chemical composition and physical structure of Bordeaux mixture; the grapevine disease of California; and peach leaf curl. Investigations of this kind precede, as a rule, the fieldwork and are designed largely to suggest the most practical means of conducting the latter.

The work on potatoes, to determine the effect on growth of spraying with Bordeaux mixture, was begun near the close of the year, hence very little need be said about it here. It would seem well, however, to briefly outline the plan of the work in order that its practical bearing may be understood.

In the earliest work of the division it was observed that Bordeaux mixture, the well-known fungicide, consisting of copper sulphate and lime, produced what appeared to be a marked effect on certain plants when applied in the form of a spray. This effect was wholly distinct from that resulting from the prevention of insect and fungous attacks, and often caused an increased yield of from 30 to 50 per cent in the case of potatoes, and a marked improvement in growth in other plants, notably grape, pear, cherry, and similar fruits. The fact that a mixture containing no recognized fertilizing elements should have such a marked effect on growth was interesting, and suggested several questions bearing on the nutrition of plants, which if settled might prove of great value. The work under consideration was largely preliminary and was designed mainly to obtain, if possible, information as to whether the increase in growth was due to a direct action of the mixture on the foliage or an indirect action resulting from the fungicide reaching the soil and producing physical and chemical changes therein, which would account for differences shown by sprayed and unsprayed plants. The solution of this question involved the consideration of numerous subsidiary ones, requiring that the plants should be grown in a greenhouse where heat, light, and moisture were all under control.

The laboratory work on pear blight was carried on by one assistant during the year. His investigations, however, were much interrupted, owing to the press of other duties. Briefly, it may be said that the life history of the organism causing blight has been further studied, the principal subjects of investigations being as follows:

(1) A study of the effect of different fungicides on the organism when grown in artificial media. This work it was thought would suggest certain lines of treatment in the field.

(2) An investigation to determine the effects of different degrees of heat and cold on the organism. It was believed that this work might throw some light on the manner in which the organism passed the winter.

(3) Bacteriological studies of insects found on the pear or known to visit it. These studies were undertaken to obtain further information on the relation of insects to the disease.

It has already been shown[1] that bees play a very important part in the distribution of the blight germ. Other insects, especially those that bite or puncture the tissues, are also important in this connection, as they no doubt often inoculate the young shoots with the germ. The studies were intended mainly to settle the point as to the presence or absence of the germs in connection with insects known to feed upon the pear.

In April, 1894, a special agent was appointed to investigate the diseases of cereals, especially rusts and smuts. Comparatively little laboratory work was done from the time of the appointment of the agent until the close of the year, the months of April, May, and [illegible] being spent largely in making preparations for the investi[illegible]s which will be discussed more fully later. Some studies o[illegible]e histories of rust fungi were started, however, and a large [illegible] of material received, in reply to circulars of inquiry [illegible]s exam[illegible]se studies will aid in obtaining information upon [illegible] fungi, and will also be of value in suggesting c[illegible] which will be described in the proper place.

[1] Report of the Secretary of Agricul[illegible]

During the year, part of the time of one assistant has been devoted to an investigation of certain diseases affecting cantaloupes, watermelons, and other plants of this family. The melon industry is assuming considerable importance, especially in the South and certain points of the West, where the crop is grown for Northern markets. One of the diseases studied has proved to be bacterial and two others have been shown to be due to fungi. The three diseases in question often sweep away entire fields in a short time.

With the exception of studies of the watermelon disease, which were pursued for six weeks in South Carolina, the foregoing investigations were carried on in the laboratory at Washington. In the work on citrus fruits and other subtropical plants, the investigations were made in the laboratory of the division located at Eustis, Fla. The special studies on Bordeaux mixture were also carried on in this labortory, the entire work being in charge of two assistants. In the investigations of blight of the orange, a critical comparative study of the water-conducting tissues of affected and nonaffected trees was made to determine if possible what differences, if any, existed. Blight has caused a loss of over three million dollars in Florida, but as yet not enough work has been done to give any clue to the cause of the trouble. The affected trees in all cases appear to be suffering from lack of water, and this fact suggested the studies to which reference has been made.

Die back of the orange, another serious and widespread disease, was made the subject of laboratory investigations. The work was mainly devoted to a study of the relation of nitrogenous fertilizers to the disease. Water cultures in the laboratory and investigations in the field seemed to clearly indicate that the disease might be produced by an improper use of nitrogen as a fertilizer. This suggests a practical means of prevention, which will be discussed under field experiments.

Sooty mold, a fungous disease affecting various citrus fruits, was made the subject of considerable study during the year. The fungus is wholly superficial, and follows, in nearly every case, the attacks of insects, notably the white fly and certain scales and aphides.

Scab, which is mainly confined to sour orange stocks and the lemon, received considerable attention during the year. In case of the lemon the disease is quite serious, often so disfiguring the crop as to make it worthless. The investigations were made largely to determine the cause of the trouble and if possible to suggest a practical line of treatment. The cause was found to be a fungus, and the facts brought out lead to the belief that the parasite can be controlled by spraying.

In the work on the chemical composition and physical structure of Bordeaux mixture an attempt was made to obtain information upon a number of points of practical value in the manufacture of the fungicide. [illegible]emistry of the mixture has never been thoroughly understood [illegible]til this is the case the best results with the preparation can r[illegible]ined.

La[illegible] work [illegible]he California vine disease and peach leaf curl was [illegible]stant at Santa Ana, Cal. The investigations of t[illegible] confined for the most part to a study of all part[illegible] view of discovering the cause of the trouble. [illegible]n the laboratory the contagious nature of [illegible] so far the nature of the contagion has not [illegible]ratory work on peach curl was carried on [illegible] formation in regard to the manner in which [illegible]isease passes the winter, and the way in [illegible] in spring. The investigations led to prac-

tical results of considerable importance, as will appear from the discussion elsewhere in this report.

2. FIELDWORK.

By fieldwork is meant the practical experiments conducted in the orchard, garden, nursery, vineyard, etc., to demonstrate the value of preventive and other treatments suggested in the laboratory. Work of this nature has always been made a strong feature of the division, as it appeals directly to the people who have, or should have, the most interest in the Department.

The fieldwork for the year ending June 30, 1894, was devoted to a number of subjects, the more important being the treatment of pear leaf blight in the orchard and nursery; experiments with fertilizers to determine their effect on pear trees as regards their susceptibility or nonsusceptibility to blight; treatment of lemon scab and sooty mold of the orange; experiments with fertilizers having different amounts of nitrogen to determine their effect in preventing die back of the orange; and experiments to determine the value of spraying peach trees in winter with the so-called sulphur, lime, and salt wash as a remedy for curl leaf.

The treatment of pear leaf blight in the orchard and nursery was conducted on a sufficient scale to obtain definite facts in regard to the cost and value of the work. Bordeaux mixture was the remedy used, and it was applied, in different ways and at different times, to about 16,000 orchard trees and about 3,000 trees in the nursery. It was found that leaf blight could be largely prevented in the orchard by two applications of Bordeaux mixture, properly made, the cost of the same being approximately 1½ cents per tree. In the nursery the work carried on for three seasons to determine the effect of spraying with Bordeaux mixture on the growth of trees, was completed. Briefly stated, it was shown as a result of this work that trees sprayed three seasons at a total cost of $1 per thousand were worth on an average $13 more per thousand than those not sprayed. The clear profit, in other words, was $12 per thousand trees.

Experiments with fertilizers were carried on for several seasons to determine, if possible, their relation to such diseases as leaf blight and fire blight of the pear. So far this work has yielded no definite results. Near the close of the year a more elaborate experiment on pears was undertaken, but as it is yet incomplete no detailed account need be given here. Suffice it to say that small trees in pots were used, the fertilizers being applied very carefully. The trees were inoculated artificially with the blight germs and the development of the disease noted. It is possible that in the future we may be able to so feed our trees as to render them proof against the blight germ.

In Florida the two assistants in charge of the work began near the close of the year some experiments to determine the possibility of preventing scab of the lemon and removing the sooty mold affecting the orange by spraying. This work being incomplete it may more properly be discussed in another report. The work with fertilizers containing different amounts of nitrogen to determine their relation to die back of the orange is also incomplete. From the facts obtained, however, it is believed that the disease can be controlled by judicious fertilization of the soil, combined, possibly, with proper drainage in some cases.

During the year some preliminary experiments made on the Pacific Coast showed that peach leaf curl, one of the most destructive diseases affecting this fruit, could be largely prevented by spraying before the *leaves started with a* mixture made by boiling together lime, sulphur,

and salt. The treatment is thoroughly practical and cheap, and to test it on a more extended scale, work was started in May of this year at several points on the Pacific Coast, also in Michigan and New York and other Eastern States.

3. ROUTINE OFFICE WORK.

The routine work of the division, including the preparation, editing, and proof reading of reports, bulletins, etc., addressing franks for the same, the care of correspondence, indexing literature, and work on herbarium specimens necessary in the preparation of the economic investigations, requires fully one-third of the time of the entire force. The time spent in this way makes little showing to the outside world, who can only judge of what is being accomplished by the bulletins issued. In the proof reading about half the scientific corps take part, as no one person, however competent, is capable of satisfactorily doing this work. Technical words and phrases, which no ordinary proof reader understands, must of necessity be used, hence the impracticability of delegating such work to those not familiar with the subjects discussed. The care of mailing lists also requires considerable time, but this is work that can be done by clerks.

The correspondence is probably the most burdensome of all the routine duties, involving the writing, copying, indexing, and filing of about 5,000 letters a year. Many of these letters are accompanied by specimens which require days and sometimes weeks of study before the questions asked about them can be properly answered. Every letter received and answered is indexed both by author and subject card catalogue. The indexing and abstracting of literature is participated in by every member of the scientific corps, the subjects being divided largely by languages. The literature of the world on plant diseases is indexed, abstracted, and filed by author and by subject card catalogue for the use of the division, and published as an author's catalogue for the benefit of experiment station workers and others.

The care of the herbarium requires about one-third of the time of one assistant, the work including the naming, inserting, and indexing of specimens received. The herbarium of the division is almost wholly an economic one, and forms as necessary an adjunct as the library.

OUTLINE OF THE WORK PLANNED FOR THE CURRENT FISCAL YEAR.

In investigations such as are carried on by the division it is not possible to plan work for a definite period ahead, excepting along very general lines. The many questions that may arise in the course of any particular investigation can not be foreseen, nor can it be determined in advance where these questions may lead nor what particular disease can be studied to most advantage in any given time.

Again, there are always emergency cases arising, which often necessitate immediate attention, to the exclusion of everything else. The plan herewith submitted, therefore, is tentative, but will be followed along the general lines laid down.

LABORATORY WORK.

In the laboratory the studies on the effect of Bordeaux mixture on the growth of plants will be continued, a special effort being made to discover the manner in which the extra growth of sprayed plants is brought about.

In the pear blight work, studies will be made to determine the manner in which the germs enter the tree. The relation of insects to the disease will also receive consideration.

The work on rusts and other diseases of cereals will be followed along two main lines, namely, investigating the life histories of the fungi causing the diseases, and studies of the rust-resisting varieties of wheat and other grains to determine if possible the cause or causes of their susceptibility or nonsusceptibility to attack. This work will involve numerous field investigations, which will be discussed in the proper place.

Recently an obscure and destructive grape disease has appeared in certain parts of Virginia. The nature of the trouble is not yet known, but the matter is being investigated in the laboratory, and will form a part of the year's work. In addition to the foregoing, studies in the laboratory here are being made on the blueing of timber, the diseases affecting lettuce, violets, and other plants grown under glass, and the blight or wilt of melons.

In Florida the chief subjects it is planned to investigate in the laboratory are blight or wilt, mal-di-goma or foot rot, die back, and scab of the orange and other citrus fruits. In the investigations of blight an attempt will be made to obtain some facts as to the contagious nature of the disease. A careful study of the wood will also be made, to determine, if possible, exactly where the disease is located. As already pointed out, it is suspected that the trouble may be in the wood of the twigs and smaller branches refusing to carry the sap which is supplied in abundance to the trunk and larger limbs, causing them to support a growth of water sprouts.

There is considerable evidence to show that mal-di-goma or foot rot is caused by lack of oxygen at the roots. Laboratory investigations will be made to obtain information on this point.

In the laboratory investigations of die back it is proposed to continue the studies of the pathological changes caused by the disease, and also to carry forward the experiments to test the effects of nitrogen on the plant.

The cause of scab has been found to be a fungus. It is planned to continue the study of the life history of the parasite, in order to obtain facts that will aid in combating it.

On the Pacific Coast, laboratory investigations of the California vine disease, the curl leaf of peach, and certain obscure maladies affecting peach, apricot, and apple will be studied. It may be said in this connection that a large part of the time of the agent in charge of this work is taken up in examinations of diseased plants of all kinds sent in from many parts of the coast. Not only the fruit growers themselves send in this material, accompanied by requests for information, but the State commissioners and officers of the State board of horticulture turn over to the laboratory much of the work sent to them.

FIELDWORK.

The fieldwork planned for the current year has already in part been discussed. Experiments with Bordeaux mixture to obtain information upon its effects on the growth of plants, will be carried forward. This work involves a study of the physical properties of soils, and in this the cooperation of the Division of Agricultural Soils has been obtained.

The experiments with fertilizers to determine their effect on pear trees, so far as making them susceptible or nonsusceptible to blight,

have already been mentioned. This work will be continued, the experiments with potted plants started at the close of the last fiscal year being made a special feature of the investigation.

Work has been planned and is now under way on the treatment of pear leaf blight in the orchard. This is intended largely to settle certain points in regard to the time required to make the treatments, and the number necessary to obtain the best results.

The melon diseases, to which considerable attention has been devoted in the laboratory and greenhouse, will be made the subject of work in the field, experiments being made with different fungicides, and with different methods of planting, cultivating, etc., to determine their effect on the diseases.

One of the important lines of work planned for the year is the testing of spraying machinery and preparations known or supposed to have fungicidal value. This work has been made a special feature of the investigations of the division, and has led to valuable practical results. Our knowledge of fungicides or remedies for plant diseases is still meager and the opportunities for good work in this direction are excellent.

In the work on rusts affecting cereals, extensive field experiments have been planned and are now partly under way. The work this year will consist largely of a test of varieties to determine their value as regards resistance to rust. Since the early part of the year the division has been making a special effort to collect varieties of wheat from all over the world. Probably 700 or 800 varieties will be obtained in this way, and small plats of each will be planted and their various characteristics noted. Those that may prove of value and give promise of being improvements on our present varieties will be made the subject of special study, and probably ultimately disseminated for testing in different parts of the country.

In Florida field experiments on blight, mal-di-goma or foot rot die back, scab, and sooty mold of citrus fruits have been planned and are under way. On the theory that blight is contagious it is proposed to start an extirpation experiment by removing all blighted trees as they appear over some entire area surrounded by land free from the disease.

In the work on mal-di-goma it is proposed to conduct some careful experiments to determine if possible whether the disease can be produced artificially by hindering the access of oxygen to the roots, and on the other hand an attempt will be made to cure the disease by aerating the roots of trees attacked.

In the field work on die back it is planned to conduct two series of experiments, both of which should be carried on for several years. One series of plat experiments with various nitrogenous fertilizers on different soils is planned. The second series will consist of cultures of plants made in vessels containing weighed amounts of different fertilizers on different soils and in pure sand. By this series of feeding experiments it is thought that information may be obtained upon the form and amount of nitrogen necessary to produce the disease and possibly the form of nitrogen fertilizer giving the best growth—a question of great importance in itself.

The work on scab, which was started near the close of the last fiscal year, will be almost wholly with fungicides as sprays. The cooperation of a number of lemon growers in different parts of the State has been secured in this matter.

Further work on sooty mold will also be carried on. Spraying with preparations that have already been found useful, and testing others supposed to be of value, will constitute the chief work.

Under the direction of the agent in California, extensive experiments have been planned in the treatment of peach leaf curl. Part of the work is now under way and gives promise of yielding important practical results.

One of the most important lines of work undertaken by the division is an investigation of the premature fall of grapes, known as coulure. This disease caused a loss of over $600,000 in the San Joaquin Valley alone in 1892. Field work has brought out the following facts: (1) That the main reason for the fall of the flowers is because the latter are not fertilized; (2) that the lack of fertilization is due mostly to extreme sensitiveness of the Muscat flowers to variations in atmospheric conditions; and (3) that strengthening the plant will prevent most of the coulure. To further strengthen the plant, three lines of work have been planned and are now under way, namely, (1) grafting Muscat grapes on roots of vines not subject to the disease; (2) the stimulation of the vine while in bloom, by fertilization of the soil; (3) the production of hardier varieties by crossing Muscat vines with a hardy stock. The grafting of the vine already gives promise of being successful, and the crossing has resulted in the production of a number of seedlings of promise.

RECOMMENDATIONS.

I would recommend that the name of the division be changed to Division of Vegetable Physiology and Pathology. This change has been contemplated for some time, and seems necessary in order to enable the division to broaden certain lines of work it is already naturally required to carry on. It is evident to anyone who has reflected at all upon the problems involved in the study of diseased plants that normal life processes must first be well understood before the diseased organism can be investigated intelligently. The science of vegetable pathology is young, and partly for this reason very little attention has been devoted to the plant excepting as it is found in a diseased condition. It seems to me that the highest aim of workers in this line should be to study the life processes of plants, so as to be able to point out the conditions necessary to attain the best development in the most economic manner. Every life phenomenon of a plant is of course physiological, in the broad sense, and has more or less important interrelation with other phenomena, both inside and outside of the organism. These relations must be determined by careful investigation before we shall be able to fully control plants under varying conditions of health and disease.

REPORT OF THE CHIEF OF THE DIVISION OF CHEMISTRY.

SIR: I have the honor to present herewith a report of the work of the Division of Chemistry for the fiscal year ending June 30, 1894.

Respectfully,

H. W. WILEY,
Chemist.

Hon. CHAS. W. DABNEY, JR.,
Assistant Secretary.

A considerable part of the analytical work of the division was done in connection with the agricultural juries of the World's Columbian Exposition at Chicago. Following are the principal articles which were analyzed in connection with the jury of awards:

In all 431 samples of cereals were examined, including samples of barley, buckwheat, maize, oats, rice, rye, and wheat. A complete chemical examination was made of each of these samples according to the methods established by the Association of Official Agricultural Chemists. The number of cereal products analyzed was 103, including samples of maize starch, wheat flour, grits, hominy, malt, meal, rice bran, wheat bran, and wheat middlings.

Thirteen flavoring extracts were also examined, viz, essences of peppermint and wintergreen, and extracts of almond, celery, cloves, coffee, jamaica ginger, lemon, nectarine, orange, peach, rose, and vanilla.

Thirty-five samples of condiments were examined for the judges of awards, including all the ordinary condiments of commerce.

Fifteen samples of baking powders were analyzed for the board of awards, together with 199 samples of wines and 221 samples of malt liquors.

In experiments in the improvement of sugar-producing plants 14,950 samples of sorghum cane were analyzed, 5,842 samples of sugar beets, and 12 samples of sugar cane.

During the year a complete set of samples was analyzed for the Association of Official Agricultural Chemists. In this work all the various methods of analysis proposed by various reporters were thoroughly tested and comparative work done. In many cases this work was done by two or even three different assistants, so as to make it as complete as possible. This comparative work seems to be one coming particularly within the functions of the division of chemistry, which owes to the agricultural chemist in all parts of the country the duty of thoroughly testing all proposed innovations in methods of agricultural chemical analysis.

The total number of samples analyzed in the division during the year amounted to 22,437.

The publications issued from the division of chemistry during the year consist of Bulletin 38 (216 pages), containing the proceedings of the tenth annual meeting of the Association of Official Agricultural Chemists; Bulletin 39 (59 pages), describing experiments in the improvement of sorghum as a sugar-producing plant; Bulletin 40 (38 pages), describing similar experiments with sugar beets; Bulletin 41 (64 pages), containing a report on the extent and character of food adulteration; and Bulletin 42 (152 pages), giving the pharmacy and drug laws of the several States and Territories.

During the year 1,856 letters, covering 2,605 pages, were written. These letters were chiefly of a technical and scientific character.

During the year the experimental stations for the improvement of sorghum as a sugar-producing plant at Medicine Lodge and for sugar beets at Schuyler were discontinued. A new experimental station for testing sugar-producing plants was established in California at a point on Union Island near the junction of the San Joaquin and Sacramento rivers. The land on which this station was established was formerly subjected to overflow. It belongs to the character of soils known in California as "tule lands." These soils consist largely of vegetable mold thoroughly intermingled with alluvial deposits. They are very rich in plant food, especially of a humic nature. The subsoil is mostly a dense, impenetrable clay known as adobe. Samples of these three constituents of the soil were carefully taken and subjected to analysis, with the following results:

Analysis of three constituents of soil.

	Sample 1, alluvial deposit.	Sample 2, vegetable mold.	Sample 3, above subsoil.
	Per cent.	*Per cent.*	*Per cent.*
Insoluble residue	55.23	45	67.76
K_2O	.34	.35	.37
Na_2O	.55	.22	.60
CaO	.99	.93	1.01
MgO	2.05	1.08	1.03
Mn_3O_4	Trace.	Trace.	.05
Fe_2O_3	11.62	6.36	6.05
Al_2O_3	11.81	7.34	8.05
P_2O_5	.34	.26	.09
SO_3	.22	.61	.02
CO_2	.03	.12	.01
Hygroscopic moisture	5.58	7.12	6.65
Combined moisture and volatile matter	13.76	29.61	9.21
Humus	(5.02)	(17.75)	(3.84)
Nitrogen	(.31)	(.90)	(.20)
Total	101.92	99	100.90

NOTE.—Figures in parentheses not added in total.

The climate in this region is mild, the frost of winter being usually very late and light and the summer temperature, with few exceptions, not very high. There are times, however, when the hot winds blow down the valley, when the temperature rises above 100° F.

The object of the experimental station is primarily to test the possibilities of growing sugar cane, while as rotation and by-crops, sugar beets, rice, flax, and other plants are cultivated.

The station was established in February, 1894, and the first planting took place in the latter part of March. Unfortunately, a box of seed sugar cane shipped from Florida miscarried and never reached its destination. The sole source of seed, therefore, was some stubble of sugar cane grown the previous year in the San Joaquin Valley. This stub-

ble was transplanted, as before intimated, during the latter part of March after the rainy season had passed. In spite of the dry weather a great part of it sprouted and made an excellent growth. The lateness of the season at which it was planted, however, will prevent it from reaching full maturity. At the end of June the crops of rice, flax, and sugar beets were in a very promising condition.

The experimental work in the production of sugar cane on the sand and muck lands of Florida has been continued during the year. The results of the work up to this time have been entirely of a negative character. The difficulties which have prevented the production of profitable crops of sugar cane have been clearly defined by past work. One of the chief of these in the muck soil is due to deficient drainage, and, to avoid this difficulty, during the spring of 1894 a few acres of muck soil were thoroughly underdrained and placed in as good condition physically as was possible in a single year.

Pot experiments with the muck soils have shown that the greatest deficiency in these soils is found in their content of phosphoric acid. The experiments have further shown that the application of the finely-ground mineral phosphate, so abundant in Florida, is quite sufficient to supply this deficiency without a previous treatment of the phosphate with sulphuric acid. It has thus been demonstrated by actual experiment that there is at hand in Florida, almost ready for application to these soils, an inexhaustible supply of the plant food which they chiefly need.

Owing to the deficient drainage mentioned above, the chief difficulty which has been encountered in the growth of sugar cane was found in the fact that after the accession of the rainy season, when the crop is under vigorous growth, there is an accumulation of stagnant water in the muck, which becomes very acid from the humic acids present in such abundance. The rootlets of the plants penetrating this supersaturated acid subsoil become poisoned and die. The consequence is that the sugar cane ceases to grow. The appearance of a crop of sugar cane growing on the muck soil is, therefore, at the time of maturity, a peculiar one. Many of the plants are seen to have attained full growth, while in other places, where the drainage has been insufficient, the crop is a total failure.

The experiments with sugar cane on the sand land have been of a much more promising nature. The sand land, although very deficient in plant food, yet has some advantages which render the culture of cane possible. First of all in this locality, viz, the central peninsula of Florida, is its almost entire immunity from frost, at least frost severe enough to affect sugar cane. This gives the crop ample time to mature.

The culture of cane is also easy. There is little tendency to the growth of weeds or grass. The great point to be observed is the proper and timely application of fertilizing materials. For the sand soils the phosphatic fertilizers are best applied in the form of superphosphates, inasmuch as there is no organic matter in the soil to promote the decomposition of the natural mineral phosphates. The more soluble fertilizers, viz, the salts of potash and nitrates, should be applied from time to time as they are needed by the growing plants. If applied all at once at the time of planting they will be almost completely leached from the soils by the heavy rains before the plants have time to assimilate them.

Samples of sugar cane grown upon the station and harvested on the 10th of March, 1894, showed over 19 per cent of sugar in their juices. It is believed that with careful agriculture, scientifically applied, a crop of

from 12 to 15 tons per acre of sugar cane can be grown upon these sand soils.

In the investigation of food adulteration work has been prosecuted during the year in the analysis of bread and cereal products. These analyses have shown that the cereal products, viz, the flours and meals of the country, are, as a rule, unadulterated with any of the inert materials which are often found in foreign countries. Not a single instance has been found of the occurrence of chalk, terra alba, or other inert, heavy earth in a cereal product. In bread the chief adulteration which has been found has been alum and lime, which are introduced with baking powders. It is claimed by some that a baking powder which contains alum or lime can not be regarded as adulterated, but experiments which have been carried on in the division indicate that the occurrence of alum, especially in breads, tends to diminish their digestibility. The use of such materials, therefore, in bread making is at least to be deprecated.

The miscellaneous work of the division during the year has been of the usual character. Quite a number of minerals has been determined and some analyses of mineral substances made. The division still receives numerous requests for the analysis of mineral waters, patent medicines, and other articles not related to agriculture. It is the uniform custom of the division to decline to make such investigations, save in some instances in the case of waters, where a qualitative examination is made. Minerals which can be determined on sight or by a simple qualitative examination are identified and the senders informed of their nature. Where a quantitive examination, however, is required this work is also declined. Fortunately, from the uniform practice of the division in refusing to make assays of gold and silver ores, the applications for this kind of work have largely diminished.

In the case of soil analyses, wherever the determination seems to be of local interest only, the sender of the sample is referred to the agricultural experiment station of the State in which he lives.

The same is true of samples of fertilizers, unless the question which is involved in their examination is one of more than local importance.

During the year past the division has made a number of investigations for the other divisions of the Department. Notably is this the case with the forestry division, to which one assistant in the laboratory has devoted his whole time. In a case of this kind it would seem only right and proper that the compensation of such assistant should be paid from the funds of the division for which he works, although the division of chemistry holds itself at all times ready and willing to afford every facility in the way of apparatus, materials, and other chemical conveniences which would be for the interest of other divisions of the Department.

The work for the coming year will be prosecuted on the lines indicated above. The experimental work at the sugar stations at Runnymede, Fla., and Union Island, Cal., will be continued. The work in the investigation of soils with special reference to their nitrifying organisms, which has been authorized by Congress, will be inaugurated during the present year.

In the matter of the adulteration of foods the work on bread and cereal products will be completed and the additional work looking to the completion of Bulletin No. 13 will be pushed forward as rapidly as possible. It is hoped that the special features of the work which are indicated in the parts of Bulletin No. 13 already published will be practically completed by the close of the fiscal year. Of especial

interest in this line of work should be mentioned the investigations of the constitution of California wines, which have been very thoroughly carried out. If a normal standard for pure domestic wines can be established, as has been done in the case of foreign wines, it will be much easier to determine adulteration. It is an undeniable fact that many of the wines which are imported into this country are of a purely synthetic character, and the American producer, as well as the American consumer, should have the right of protection against these imitations.

The same remark may, with equal force, be applied to other important food articles, especially those like olive oil and condiments, which are so often subject to adulteration. This work of the division has kept in view, during all the years of its continuance, the possibility of securing pure food products, whether of domestic or foreign origin, both in the interest of the producer and consumer.

REPORT OF THE ENTOMOLOGIST.

SIR: In accordance with your general order dated July 27, 1894, I have the honor to submit the following report from the Division of Entomology. It should be stated that the period covered by this review, June 30, 1893, to June 30, 1894, includes but thirty days of the administration of the present chief of the division.

Respectfully,

L. O. HOWARD,
Entomologist.

Hon. J. STERLING MORTON,
Secretary.

REVIEW OF THE WORK.

The work of the division in the main was continued along the same lines indicated by previous reports. The principal change of the year was the removal of the entire force of field agents, the most of whom had been connected with the division for a number of years. As indicated in the last report, which covered the calendar year 1893, Messrs. Albert Koebele and D. W. Coquillett, the California agents of the division, were given the alternative of resigning or coming to Washington. Mr. Koebele resigned September 30, 1893, while Mr. Coquillett came to Washington, and now holds the position of investigator in the office. Messrs. Lawrence Bruner, Herbert Osborn, and Samuel Henshaw and Miss M. E. Murtfeldt were removed from office on February 15, 1894. All of these agents, with the exception of Mr. Henshaw, and with the addition of Messrs. A. S. Packard and J. G. Barlow, who received temporary appointments during the summer of 1893, submitted reports upon their work, most of which have been published in Bulletin 32 of the division.

Aside from this removal of all field agents drawing annual salaries, in pursuance of the policy of employing field agents for limited periods and specific purposes only, particularly in cases of emergency, another important change in the personnel of the force was caused by the resignation June 1, 1894, of Prof. C. V. Riley, chief of the division, who had held that office since June, 1878, with the exception of the years 1879 and 1880. The vacancy was filled by the promotion of the first assistant, and the vacancy in the position of first assistant thus created was filled by the promotion of Mr. C. L. Marlatt from the corps of office investigators.

The routine work of the year comprises—

(*a*) Investigations upon special insects or groups of insects; (*b*) experiments with insecticides and insecticide machinery; (*c*) corre-

spondence; (*d*) the determination of insects sent in by entomologists to agricultural experiment stations and others; (*e*) proof reading, and other supervision of the publications of the division.

The special investigations carried on during the year were substantially as follows:

The subject of insects injurious to stored grain was forced upon the attention of the division by the abundance of certain species in the grain exhibits at the World's Columbian Exposition. An investigation was immediately undertaken, which subsequently was made to include an examination of all insects affecting foreign exhibits of all kinds at the exposition, the idea being to ascertain just what foreign insects had been introduced by exhibitors and to point out the dangerous species, in order to prevent their acclimatization in the United States. The results of this latter portion of the investigation have been published in Insect Life, and in the same article a summary has been given of the insects found injurious to stored grain. This portion of the investigation, however, is by no means completed, and the results will be published in sections from time to time.

During the year the San José, or pernicious, scale was found to have become established in certain Eastern orchards. Careful investigations of its spread have been made, and an extensive series of experiments with remedies has been instituted.

The investigation of the bollworm of cotton was practically completed with the publication of Bulletin 29, in May, 1893, but the continuation of the appropriation by Congress allowed the expenditure of a small amount in supplementary work. Field operations were therefore carried on in the State of Mississippi during the months of July and August, 1893.

A destructive scale insect new to the fauna of the United States (*Diaspis lanatus*), and which bids fair to become an important enemy to the peach and certain other important fruit crops, was found during the summer of 1893 to have become established in the District of Columbia, Georgia, and Florida. Careful observations upon its life history were made, and remedial work was carried on in the District of Columbia, resulting in the extermination of the species upon the Department grounds, and establishing a method of procedure for use in other localities.

The parasites of the red scale in California, one of the most important enemies of the citrus industry on the Pacific Coast, have been studied, and the species named and described.

The occurrence of two broods of the periodical cicada over a large portion of the Eastern United States during the early part of 1894 has afforded an opportunity for the more careful mapping of the extent of the two broods. The affected territory has been thoroughly circularized, and a considerable amount of new information concerning the two broods has been gathered.

During the summer of 1893 a destructive outbreak of the western cricket and of certain injurious locusts was investigated in parts of Idaho by a temporary agent appointed for the purpose.

An attempt was made during the winter of 1893–94 to introduce from the south of Europe an important enemy of the black scale, an insect which occurs in destructive numbers upon the olive and upon citrus trees in California. This attempt has not, up to the present time, proved successful.

In connection with the State entomologist of Illinois, the chancellor of the University of Kansas, and the director of the Missouri State

Agricultural Experiment Station, an investigation of the injuries of the chinch bug during the early part of the season has been carried on. Inasmuch as previous investigations of this important insect have been conducted in isolated localities only, the present comprehensive study, over the entire region infested, can not fail to produce valuable results. This investigation, begun in June, belongs more properly, however, to the fiscal year ending June 30, 1895.

The work in bee culture has consisted, in the main, in a somewhat extensive correspondence with persons engaged in this important industry, and in the preparation of a manual on bee culture, which is nearly completed at the date of this writing.

The fourth part of the Bibliography of American Economic Entomology, comprising the writings of authors whose names begin with the letters from A to K, inclusive, upon American economic entomology down to the close of the year 1889, was practically completed. The compiler, Mr. Samuel Henshaw, has retained the manuscript for a few weeks only, pending the adding of some few additional references.

In the way of insecticide apparatus from 12 to 15 pieces have been added to the collection of the division during the year, chiefly by donation from manufacturers, and particularly from the V. Vermorel exhibit at the World's Columbian Exposition. Very many experiments with insecticide mixtures were carried on during the early part of the year 1894, and these have been continued into the present fiscal year, so that it is difficult to draw a dividing line between experiments prior to June 30, 1894, and those subsequent to that date.

The correspondence of the division has been about as heavy as during the preceding fiscal year, but by the publication of circulars and the use of mimeographed forms, its apparent size has been reduced. Aside from letters answered by circulars and forms of these types, some 4,000 inquiries relative to injurious insects have been answered.

The important branch of the work of the division, which comprises the determination of insects for workers in economic and systematic entomology, has been about as heavy as usual. Something over 2,000 species have been named in this way.

The publications of the division during the fiscal year have been as follows:

	Pages.
Insect Life, Vol. VI, Nos. 1, 2, 3, and 4	346
Bulletin 21 (second edition)	32
Bulletin 31	121
Bulletin 32	55
Farmers' Bulletin 19	20
Circular No. 3, second series	10
Circular No. 4, second series	5
Total of printed pages	589

REPORT OF THE BOTANIST.

SIR: I have the honor to submit herewith my second annual report, for the fiscal year ending June 30, 1894, reviewing briefly the year's work of the Division of Botany.

Very respectfully, FREDERICK V. COVILLE,
Botanist.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

WORK OF THE YEAR.

The fiscal year ending June 30, 1894, has been devoted largely to a reorganization of the Division of Botany upon the basis of strengthening and broadening its work. The method followed to attain this result has been not to enlarge the scope of the division's work to cover the whole range of botany, but to direct the energies of each investigator to some specific problem, and to relieve him, so far as possible, from routine duties. The result promises to be highly satisfactory with regard to the whole amount of work produced. The most important steps taken during the year have been the discontinuance of the forage experiment station at Garden City, Kans., the appointment of a special agent for the investigation of grasses and other forage plants, and the appointment of an assistant to investigate the purity and germinative capacity of commercial seeds. The work on each of these subjects is outlined in the topical review that follows.

THE HERBARIUM.

In order to make the most useful disposal of the miscellaneous collections in the possession of the division, but not actually incorporated in the herbarium, a full set of the valuable portion of this material, 28,662 sheets in all, has been mounted and inserted in the herbarium, while the duplicate specimens have been distributed among 15 agricultural colleges and experiment stations and 18 educational institutions of other kinds, 7 of them in foreign countries. By means of the extra force employed for this purpose these accumulated miscellaneous collections are almost all out of the way, leaving for future disposition only the collections currently received.

Attention is called again to the unsatisfactory condition of the herbarium's quarters in the present building of the Department. Its continued growth has necessitated an increase in the number and height of the present cases, and the rooms, already overcrowded, are reaching the limit of their capacity. Indeed, a portion of the herbarium, including

the coniferous trees and several groups of lower plants, has already been transferred to one of the balconies of the library. The value of the herbarium has been variously estimated at from $150,000 to $250,000, and in view not only of its want of room but of its constant liability to destruction by fire, the only satisfactory place in which to put it is a commodious fireproof building.

FORAGE PLANTS.

March 24, 1894, Prof. F. Lamson-Scribner, the recognized American authority and expert on grasses, was appointed to conduct investigations on forage plants. The popular demand for information on this subject is evidenced by the great number of letters received by the Department asking especially for new and improved forage plants and for those adapted to peculiar soils and conditions. These objects have, therefore, been selected as the principal ones for immediate investigation, and at the same time reports looking toward popular education on the general subject of grasses are planned.

The commercial importance of a study of our forage plants is evidenced by the fact that the total product of the hay crop of the United States for the calendar year 1893, as estimated by the Division of Statistics, was 65,766,158 tons, valued at $570,882,872. The total value of pasturage in the United States, which has not been estimated, is perhaps equally great, and in this direction especially investigations are likely to prove of great value.

The present scope of Professor Scribner's work is indicated by the publications he now has in preparation. The first of these is a report which may be entitled The Forage Plants of the United States, suitable for the practical use and information of farmers regarding the grasses, clovers, and other plants valuable for pasturage, hay, and silage in various parts of the United States. This work will be begun by issuing from time to time circulars of information for farmers, devoted to single forage plants. A second publication now under way is a report which may be designated A Handbook of the Grasses of the United States, which is to contain descriptions and illustrations of all the known grasses of the country. This work is intended for the use of botanists and agricultural students, and will aim to give such persons the means of identifying accurately and readily our native and introduced grasses.

SEEDS.

Early in the fiscal year plans were formulated to institute a series of laboratory investigations on the purity and germinative capacity of American seeds. After a careful search it was found impossible, on account of the comparative infancy of this line of investigation in the United States, to secure a man already an expert and authority on the subject. Through a civil-service examination held in December, 1893, was obtained a younger man, Mr. G. H. Hicks, well prepared by a literary, business, and botanical education to undertake the work.

The value of farms devoted exclusively to the raising of seeds in the United States was found by the census of 1890 to be $18,325,935. Statistics of the value of the annual seed crop, both imported and domestic, are unfortunately not available, but it undoubtedly reaches many millions of dollars. The export of clover seed alone for the year ending June 30, 1894, had a total value of $4,540,822. The importance, therefore, of increasing the domestic use and the export of American

seed by raising the standard of purity and germinating capacity and by diffusing information as to its high standard is at once apparent.

A laboratory well equipped with apparatus for separating, weighing, identifying, and germinating seeds has been built in the fourth floor of the main building. A collection of seeds to be used in identifying the seeds of weeds or other plants occurring in commercial samples is being rapidly accumulated by collecting, by gift, and by exchange. In addition, a nearly complete library of the literature of the subject, most of it produced in the last few years from the seed control stations of Germany, has been brought together and indexed.

A specific investigation of American clover seed has been planned and work on it already begun, the object being to collate and publish all the information which may aid in the production of a stronger and cleaner grade of clover seed, with reference not only to domestic use but to the export trade as well. The work of these seed investigations is preeminently educational, and close cooperation with the State experiment stations is therefore contemplated.

Early and continued attention will be given toward devising, by experiment and commercial application, a system of grading seeds. Such trade names as "prime," "extra prime," and "choice" are of only relative value, and in the catalogues of different firms have a varying significance. A system is demanded in which the points of excellence may be tabulated and the grade of a sample expressed numerically. For each kind of seed a standard grade should be adopted, and the excellence or deficiency of samples with respect to this standard should be the basis of their market value. The factors to be taken into account in ascertaining the grade of a sample are its purity and germinative capacity, expressed on a scale of 100. The selection of a standard grade for a particular variety must be based upon the examination of large series of commercial samples and the adoption of an approximate average. The results will be very different in the case of different seeds; for example, in red clover the common average of purity and germinative capacity is 90, while in Kentucky blue grass the common average is 50, indicating that under ordinary conditions of production higher grades of these seeds can not be expected. Such a system is already in partial use among German seedsmen and is much needed in the United States.

WEEDS.

In the reorganization of the division Mr. L. H. Dewey, assistant botanist, has been assigned to special work on weeds. No data are accessible for determining even approximately the amount of damage to agricultural production caused annually in the United States by weeds. The fact, however, that a single weed, the Russian thistle, from a careful estimate appears to have caused damage in the year 1893 to the amount of $3,000,000 to $5,000,000, principally within the limits of two States, gives a suggestion of the total loss. There are scores of other plants which are claimed to cause in the regions occupied by them quite as much damage as the Russian thistle, and although this can not be verified from actual data, it is undoubtedly true that several times the amount mentioned above is annually lost by the farmers of the United States through the damage caused by weeds.

The weed pest in the United States, as in all other countries, is a constant drain upon the agricultural resources of the nation, and, like drought or any other natural and irremediable agency, is generally treated in practice as beyond the control of the farmer. It is evident,

however, that in the vast majority of cases weeds are capable of almost complete subjection at an expenditure of labor easily within the power of the farmer and at a cost considerably less than the customary loss to to his crops. The product of the principal crops for the calendar year 1893, including corn, wheat, oats, rye, barley, buckwheat, tobacco, potatoes, and hay had a total value of $1,760,489,273. An increase of 1 per cent, which is easily obtainable in these crops through the subjection of weeds, would have amounted in this year alone to more than $17,000,000.

The division has planned to disseminate circulars containing popular descriptions, with illustrations, which shall enable farmers to identify their weeds, and which shall contain directions and recommendations, derived from experiment and experience, on the best methods of their eradication. In the present elementary stage of this work, and on account of the want of such circulars, the correspondence on the subject of weeds is unusually heavy and is steadily increasing. In the near future it will be possible to answer many of these letters by circular.

THE RUSSIAN THISTLE.

In the fall of 1893 Mr. Dewey was again sent, as in 1892, to the thistle-infested region of the Northwest, and finished his investigations of this weed in a thoroughly satisfactory manner. The result of this work was published in a report entitled, The Russian Thistle; its History as a Weed in the United States, with an Account of the Means Available for its Eradication. This report, containing ample illustrations and maps, gives full information on methods of destroying the weed, dealing exhaustively with the practical side of the question. The data for the year 1893, collated in the report, show that the Russian thistle occurs as a destructive weed in North and South Dakota and in portions of Nebraska and Iowa, while it has been found in scattered localities in Wisconsin, Minnesota, and Colorado.

Whatever the ultimate progress of this weed, it may be stated that more literature aimed at its destruction has been issued from the Department of Agriculture and from State experiment stations within the past two years than has been devoted to any other single weed during the whole history of the country.

FIELD WORK.

During the year collectors have been employed in Alaska, Oregon, Washington, Idaho, Utah, Nebraska, and Kansas, and reports on the floras of some of the regions examined have been prepared. The lack of a sufficient force for elaborating these collections has prevented, however, a full realization of the available results.

CORRESPONDENCE.

A large amount of time has necessarily been devoted to the official correspondence of the division, the principal part of this correspondence consisting of answers to requests for information on some of the subjects that are now under investigation. Although addressed to the needs of individuals and not usually available for general publication, such letters are answered with care, and often after the expenditure of considerable labor in collating or verifying the contained information. During the year 2,982 letters have been written, copied, and sent out,

in addition to many thousand circulars, return acknowledgment cards, printed answers to requests for publications, etc. This work has been a serious tax on the divisional force, making an especial draft on the time of the Botanist himself.

Another class of correspondence which requires a large amount of time in addition to that taken up in the actual writing of the letters is the identification of plants received from all parts of the country, usually single specimens sent by private parties, but sometimes, especially those from experiment station botanists, packages containing hundreds of specimens. The work of identifying these plants has been intrusted principally to Dr. J. N. Rose, assistant botanist, and occupies the principal part of his time.

PUBLICATIONS.

The following publications have been issued during the year:

Report of the Botanist for 1892. By George Vasey, 1893. 8°, pp. 201–214, 9 plates.

Contributions from the United States National Herbarium, Vol. I, No. 7. Systematic and Alphabetic Index to New Species of North American Phanerogams and Pteridophytes. Published in 1892. By Josephine A. Clark. Issued July 15, 1893. 8°, pp. iii, 233–264, index.

Contributions from the United States National Herbarium, Vol. I, No. 8. Notes on some Pacific Coast Grasses, by George Vasey; Descriptions of New or Noteworthy Grasses from the United States, by George Vasey; Descriptions of New Grasses from Mexico, by George Vasey; Descriptions of New Plants from Texas and Colorado, by J. M. Holzinger; List of Plants New to Florida, by J. M. Holzinger; Descriptions of Three New Plants, by J. N. Rose; List of Lichens from California and Mexico, collected by Dr. Edward Palmer from 1888 to 1892, by J. W. Eckfeldt. Issued October 31, 1893. 8°, pp. iii, 265–292, index, 5 plates.

Contributions from United States National Herbarium, Vol. IV. Botany of the Death Valley Expedition. A Report on the Botany of the Expedition sent out in 1891 by the United States Department of Agriculture to make a Biological Survey of the Region of Death Valley, California. By Frederick Vernon Coville. Issued November 29, 1893. 8°, pp. viii, 363, 21 plates and frontispiece.

Contributions from United States National Herbarium, Vol. II, No. 3. Manual of the Phanerogams and Pteridophytes of Western Texas. By John M. Coulter. Issued May 10, 1894. 8°, pp. v, 347–588.

Contributions from the United States National Herbarium, Vol. iii, No. 2. Preliminary Revision of the North American Species of Cactus, Anhalonium, and Lophophora. By John M. Coulter. Issued June 10, 1894. 8°, pp. iii, 91–132, index.

Bulletin No. 15. The Russian Thistle: Its History as a Weed in the United States, with an Account of the Means Available for its Eradication. By Lyster Hoxie Dewey. Issued (June) 1894. 8°, pp. 32, 3 plates, 2 colored maps.

Hungarian Brome Grass. By F. Lamson-Scribner. Issued (June) 1894. 8°, pp. 4.

PLANS FOR THE ENSUING YEAR.

It is proposed to continue during the year beginning July 1, 1895, the general lines of work already described, with certain enlargements, and the assumption of an additional subject of investigation, namely:

POISONOUS AND MEDICINAL PLANTS.

The division is almost constantly the recipient of inquiries on the medicinal value or poisonous qualities of native American plants, and in many cases these inquiries have more than the fanciful importance commonly attributed to them. During the year plants of undoubted medicinal value not recognized in our pharmacopœia have been received and are now awaiting a pharmacological examination. But a matter of more immediate public importance is the diffusion of information on plants known or reputed to be poisonous. One case of this

kind brought to the attention of the division was the death of five children early in the summer at Tarrytown, N. Y. These children had mistaken some root for sassafras, and after eating small quantities of it passed quickly through the successive stages of nausea, fever, convulsions, and death. The roots eaten by these boys have been found upon a careful examination to be nothing else than those of the common elder. If such an unknown danger as this lies almost at every man's door common humanity demands that the subject be investigated and the public be educated to the point of self-protection.

NEW FORAGE PLANTS.

There is little doubt that the parks and other natural grazing areas of the northern Rocky Mountain region contain succulent and nutritious grasses capable of successful introduction into cultivation. In this region wild species related to our cultivated fescue, red-top, and blue grass grow in the greatest profusion and luxuriance, and no systematic attempt has as yet been made to ascertain the possibility of their adoption into cultivation. It is recommended that liberal opportunity be given to examine these grasses in the field, and that space be set aside on the Department grounds for their tentative cultivation, while further arrangements be made for the testing of the more promising kinds in fields of larger size.

SEED INVESTIGATIONS.

It has been found necessary in connection with the experimental work of the seed laboratory to have greenhouse facilities for growing plants from some of the germinated seeds, and it is recommended that such facilities be provided.

REPORT OF THE CHIEF OF THE DIVISION OF ORNITHOLOGY AND MAMMALOGY.

SIR: In compliance with an order from the Secretary, dated July 27, 1894, I submit herewith a report on the operations of the Division of Ornithology and Mammalogy for the fiscal year ending June 30, 1894.

Respectfully, C. HART MERRIAM,
Chief.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

WORK ON GEOGRAPHIC DISTRIBUTION.

During the past year the regular work of the division has progressed along the lines heretofore laid down, without any material departure. The work on geographic distribution has been pushed as rapidly as practicable, both in studying the problems involved and in collecting new information in the field. In the former direction most satisfactory results have been attained, and it is believed that the problem of the temperature control of the geographic distribution of animals and plants, on which the division has been engaged since its establishment nine years ago, has been finally solved. The necessary temperature data, received from the Weather Bureau, have been platted on large scale maps of the United States, and have been found to conform in the most gratifying manner to the boundaries of the life zones, as ascertained by a study of the actual distribution of species in the field. The laws of the temperature control of distribution have been formulated, and it is expected that the results of the investigation will be published within a few months, accompanied by colored maps.

The study of the life zones in the field has been carried on over large areas in the West, from Texas, Arizona, and Mexico to our northern boundary, and slightly beyond in British Columbia and Assiniboia. On the northern plains the dividing lines between the Upper Sonoran and Transition zones, and between the Transition and Boreal, have been followed, from the point where the work stopped in Wyoming last fall, northward and eastward over parts of the Dakotas and the larger part of Montana. At the present rate of progress it is believed that the task of running the boundary lines between the various zones, with sufficient detail for a small scale map of the United States, can be completed within three years.

During the fiscal year field work has been carried on in no less than 22 States and Territories, including all those west of the one hundredth meridian, excepting Idaho and Nevada. East of the one hundredth meridian work has been done in Missouri, Arkansas, Indian Territory, Alabama, Georgia, Florida, and Pennsylvania.

THE STUDY OF JACK RABBITS AND POCKET GOPHERS.

In California special efforts have been made to ascertain the complementary ranges of the two species of jack rabbits which inhabit that State, and which cause great damage to crops and orchards. In the Southern States, the Mississippi Valley, and the Great Plains, the investigations have been directed largely toward procuring material for an exhaustive study of the pocket gophers. The species of these animals are numerous, and are found from Minnesota and the Dakotas southward through the Mississippi Valley and the tablelands of Mexico to the mountains of Guatemala and Costa Rica. In the Mississippi Valley and in Mexico the losses they inflict upon the farmer are much greater than those caused by any other mammal inhabiting the same region. The results of this work, now ready for the press, will soon appear in two publications: (1) A popular bulletin dealing with the habits, injury to crops, and means of exterminating the animals, illustrated by colored plates and maps showing the ranges of the species inhabiting the United States; and (2) a technical monograph containing full descriptions of the species and an account of the cranial and dental peculiarities of the several genera.

The division is engaged in the preparation of a number of special papers on particular groups of mammals, similar in scope and general character to the bulletin on the ground squirrels of the Mississippi Valley already published. As above stated, a bulletin on the pocket gophers is ready for the press, and others are considerably advanced, treating of the kangaroo rats, pocket mice, wood rats, ground squirrels, and rabbits.

The purely economic work on the food habits of birds and mammals has been continued, and 1,440 birds' stomachs have been examined in the laboratory, the number received during the same time being 3,420. Many stomachs of mammals also have been examined, both in the laboratory and in the field; the former mainly pocket gophers, the latter chiefly carnivores. All the material available for a study of the food habits of the kingbird has been examined, and a report on the same is ready for the printer. The examination of nearly 2,700 stomachs of blackbirds was completed during the year, and the results are now being tabulated and prepared for publication.

The data on the geographic distribution of several hundred species of mammals and birds obtained by the field force of the division have been tabulated and mapped as far as possible.

ROUTINE WORK.

The routine work has consisted largely, as heretofore, in the preparation of bulletins, in correspondence, and in directing the work of field agents and furnishing them with necessary supplies. The number of letters received during the year is 6,403. Many of them were accompanied by schedules, reports, and notes, which have been examined and filed for future reference. During the same time 3,400 letters were written; several hundred schedules were distributed to observers and correspondents; 372 packages were received, and 553 packages sent out. Much time also has been consumed in the identification of specimens, in the care of collections, and in preparing reference lists useful in the work of the division. A card index of the genera of mammals has been nearly completed.

PROPOSED WORK.

It is planned to continue the field work as heretofore, with two principal objects in view: (1) To carry the biological survey as rapidly as practicable over the remaining unmapped areas; (2) to obtain the material (specimens and information on food habits) necessary for the completion of the special bulletins already mentioned.

The work in the laboratory has been handicapped for the past six months, owing to the resignation of Prof. Walter B. Barrows, who had immediate charge of the work on the food of birds. In order to bring this and other office work up to date it is desirable to add two assistants to the force, one at $1,000 per annum, the other at $720. The aggregate of these two salaries will be less than the sum formerly paid to the assistant in charge of the economic work.

REPORT OF THE CHIEF OF THE DIVISION OF RECORDS AND EDITING.

SIR: I have the honor to submit herewith a report of the work of this division for the fiscal year ending June 30, 1894, together with recommendations and estimates for the fiscal year 1896.

Very respectfully, GEO. WM. HILL,
Chief.

Hon. J. STERLING MORTON,
Secretary.

WORK OF THE YEAR.

The total number of publications passing through the division for the fiscal year is 205. They include (1) publications chargeable to the regular printing fund of the Department, (2) publications chargeable to the division funds, (3) publications printed at the Weather Bureau, and (4) publications issued as executive documents by authority of Congress. The following statement shows the total number of publications, divided as above, and a complete list of the publications for the fiscal year is appended, arranged under the several divisions in which they originated:

Number of publications chargeable to regular fund	136
Number of publications chargeable to division fund	7
Number of publications printed at Weather Bureau	56
Number of publications issued as executive documents	6
Total	205

Of the above publications 3,169,310 copies were printed, and the number of printed pages represented by these bulletins amounts to 10,512, exclusive of reprints. This fairly represents the actual amount of publication work prepared for the printer in this division.

Owing to the fact that provision was not made by Congress for the printing of the Annual Report of the Department until April 10 of the present year, and for that of the Weather Bureau until May 25, there has been very great delay in the issuing of those documents. The Annual Report of the Department for 1893 is, however, now in type, and were it not for the delay occasioned by the illustrations, for which ample time must be allowed, we might have looked for copies by August. As it is, it seems doubtful at this writing whether we can obtain bound copies before October 1.

It is gratifying to state that the number of farmers' bulletins issued from the Department has been considerably greater than in any pre-

vious year, and there are many indications that the usefulness and availability of this form of publication is being more and more appreciated. The titles and editions are shown in the following statement:

Farmers' bulletins, July 1, 1893–June 30, 1894.

Number of bulletin.	Title.	Number of copies.
13	Cranberry Culture	5,000
14	Fertilizers for Cotton	50,000
15	Some Destructive Potato Diseases, etc	50,000
16	Leguminous Plants for Green Manuring, etc	100,000
17	Peach Yellows and Peach Rosette	15,000
4	Fungous Diseases of the Grape and Their Treatment (reprint)	3,000
5	Treatment of Smuts of Oats and Wheat (reprint)	5,000
8	Results of Experiments with Inoculation for Hog Cholera (reprint)	2,500
9	Milk Fermentations and Their Relations to Dairying	3,000
11	The Rape Plant; its History, Culture, and Uses (reprint)	10,000
12	Nostrums for Increasing the Yield of Butter (reprint)	10,000
14	Fertilizers for Cotton (2 reprints)	25,000
	Total	278,500

COST OF THE PRINTING AND BINDING.

The following table shows the total expense of printing and binding incurred by the Department, with the amount chargeable to each bureau and division:

Statement showing expenditures for printing and binding for the several bureaus and divisions of the United States Department of Agriculture for the fiscal year ending June 30, 1894.

From the fund appropriated for the public printing and binding—	
Bureau of Animal Industry	$3,137.26
Weather Bureau	6,064.66
Division of Accounts	1,121.68
Division of Agricultural Soils	110.50
Division of Botany	5,476.13
Division of Chemistry	1,885.21
Division of Entomology	3,325.53
Office of Experiment Stations	22,213.86
Office of Fiber Investigations	477.12
Division of Forestry	684.32
Division of Gardens and Grounds	74.48
Office of Irrigation Inquiry	729.03
Library	1,447.88
Division of Microscopy	781.65
Division of Ornithology and Mammalogy	528.68
Division of Pomology	7.45
Division of Records and Editing	222.49
Office of Road Inquiry	1,743.29
Division of Statistics	13,462.45
Division of Vegetable Pathology	3,157.61
Miscellaneous	1,706.41
From funds appropriated for the Department—	
Bureau of Animal Industry	2,233.10
Division of botany	1,387.10
Total	71,977.89

In reference to this sum I may add the following particulars, viz, that of the total of $71,977.89, $7,646.87 was incurred for blanks and blank books, over $4,000 of this sum being chargeable to the Weather Bureau. Binding cost the Department for the year $4,190.95, of which $1,320.65 was for the library and the remainder for the publications issued from the several divisions.

DUTIES DEVOLVING UPON THE DIVISION.

The foregoing refers entirely to the main duty of this division, viz, the supervision of its publications. As this, however, involves a considerable amount of work in detail, which I think is not fully understood, I deem it just to the employees of the division to set it forth duly in this place and to indicate, moreover, numerous additional duties devolving upon the division, and which have accrued to it as naturally corelated to the work of publications or by special assignment for particular reasons.

THE SUPERVISION OF PUBLICATIONS.

As regards the supervision of publications, every document or manuscript of any kind intended for publication is first submitted to this division. It is here read and examined in order that anything deserving the personal attention of the Secretary or Assistant Secretary shall be called to the attention of one or the other with recommendations for modification, elimination, or change of any kind which is deemed to be necessary or desirable. Consultation follows with the chief of the division in which the bulletin originated, as to form, style, size, character of distribution, etc. These details settled, one of the employees of this division prepares the manuscript for the printer, which often involves rearrangement of the matter and consultation with the author, and supplies all the information necessary for the compositor. The requisition book is, of course, kept in this division, and all the requisitions for printing are made out in this office. A record is kept of the work from the time the manuscript is submitted until the final delivery of the completed publication. All the proofs coming from or going to the printer pass through this office, and all correspondence relating to the printing of the Department is handled here. This is in conformity with the special order of the Secretary directing that all official communication of whatever kind between the Department and the Public Printer, relative to the printing of the Department, shall pass through this division, and that no communications, proofs, or documents relative to the public printing of the Department received by the Public Printer shall be recognized by him as official and authorized unless bearing the stamp of this division.

A general account of the printing fund is kept in the office, and also a ledger account with the several divisions, so that each may be properly charged with the amount of the printing fund devoted to its use.

The proof reading and indexing of the Annual Report, of all miscellaneous publications of the Department, and of a considerable part of the division work devolve upon this division, which is also charged with the reading of all proof printed in the Department printing office.

THE PREPARATION AND DISTRIBUTION OF PRESS NOTICES, ETC.

Other work of the division consists of the preparation and distribution of advance notices of publications to the press. This includes a monthly list of all the publications issued from the Department, which is sent to all persons applying, as many do, for all the publications of the Department. As this request can not be complied with, the monthly publication list is substituted, from which the recipients may select such publications as they need. A large amount of correspondence, in addition to that entailed by the supervision of the printing work, is handled in the division on account of its identification with

the publication work of the Department. The preparation and distribution of the monthly publication list has resulted in a considerable increase in this correspondence, not only in that addressed directly to the division, but in that which reaches it from other divisions. In addition to these several duties, this division has been, since it was established, the main channel for the communication to the press at large of all information relative to Department matters, a duty which from being merely incidental has become a matter of considerable importance, occasionally taking up a great part of the time of the chief.

MISCELLANEOUS WORK.

All the newspaper clippings ordered for the Department from the press bureau, and marked papers relating to Department matters, are received and distributed in this division. Four scrapbooks are kept in the division itself, and all articles and clippings not kept in them are promptly distributed to the divisions to whose work they refer.

During the year a very considerable demand for our publications from libraries suggested the necessity of discrimination. With the assistance of a very full report on libraries, issued from the Bureau of Education, a list of several hundred free libraries was prepared in this division for the use of the Document Room, and will be kept up hereafter under the supervision of the librarian. A newspaper mailing list is kept in the division and numbers now 383, 288 of these being agricultural papers, and the remaining 95 nonagricultural. There is besides a special list of correspondents, editorial writers, and others, numbering some 200 names, to which all our advance notices are sent. I desire to call attention to the fact here that in addition to the correspondence, which is increasing, the very frequent necessity for the preparation of special matter for the printer, the frequent recopying of portions of bulletins, etc., necessitates a very large amount of typewriting, the time of the single typewriter allowed the divison being taxed to the utmost.

The office force has during the year lost its late assistant chief by resignation, his place having been filled by the promotion of the second assistant, whose place has, however, not been filled. A further change seems, unfortunately, imminent, and is apparently unavoidable, in the person of the next assistant, owing to the fact that Congress has seen fit to cut down the salary asked for a second assistant from $1,600 to $1,400, an economy which will cost the division the services of a competent employee whose experience it would be specially desirable to retain, in view of the previous loss of one experienced man, as reported above.

The force on June 30, 1894, consisted, in addition to the chief, of one assistant at $1,600, one clerk of class 1, one clerk at $1,000, and one messenger, assigned from the general messenger force of the Department, at $480.

I am pleased to state that each one of the employees has a satisfactory record for deportment and efficiency.

SUGGESTIONS AND RECOMMENDATIONS.

So much for the work of the past year. The following suggestions are made for carrying on the work of the current year. Having already in previous reports called attention to the unavoidable waste in the documents of the Department, owing to the lack of some well-considered and discriminating scheme of distribution, I will content

myself with stating the fact that this difficulty is by no means remedied, and by reiterating the conviction expressed in my last year's report that no effective method of economical and satisfactory distribution can be secured as long as the vicious principle obtains of free distribution to every applicant until the edition of a work is exhausted.

I earnestly renew my recommendations for the passage of a law authorizing the Secretary of Agriculture to affix a price to any publication of the Department which, in his opinion, is not a subject for free distribution, such price not to exceed the cost of paper, printing, and binding, with perhaps a slight percentage added for handling, the three main items to be estimated by the Public Printer. Such a law should be supplemented by another providing that all publications printed for an entirely free distribution should be so marked on the title page and at least once on every signature throughout the book, and a penalty should be attached to the sale or purchase of such works.

Similarly, as regards serial publications, I desire to repeat with emphasis the objections urged against this form of publication in my last report. While there are cases in which it is justifiable, and even necessary, every succeeding year's experience in this division presents additional confirmation as to the wastefulness of this form of publication.

I desire to suggest for the consideration of those specially interested the propriety of more clearly defining the classification of our publications by the adoption of particular forms and sizes according to the character of the publication, and, suitable forms having been adopted in accordance with this suggestion, that variations therefrom be, if possible, altogether avoided.

Where large charts are indispensable, and the number of these in proportion to the text either preponderates or is very considerable, a regular chart form should be adopted and a suitable size of text and printing be decided upon. Furthermore, I am of opinion that in spite of the additional expense involved it is desirable to adopt a form by which the charts shall be bound in the center, with the result that the book shall be but little more than one-half the size of the open chart. All the purely scientific publications of the Department should be printed in the size known as census quarto, which is the best suited to certain illustrations and is found to be of special use for the extensive tables often required in scientific reports, and they should be styled "Reports" or "Special Reports." The term "bulletin" should never be applied to these scientific reports, but only to publications intended for practical workers, and these and the farmers' bulletins and circulars of information should all conform to the regular Government octavo size.

The work of the current year has been largely increased by the orders of the Secretary of August 20 and August 29, 1894, attached hereto. The first involves the supervision of the expenditure of a fund of $30,000, securing a suitable variety in the subjects of the farmers' bulletins published to meet the requirements of the law, and the keeping of a separate account with every Senator, Representative, and Delegate. The second requires the keeping of an additional account with every division having illustration work and the general supervision, under the direction of the Assistant Secretary, of the reproduction for publication of all drawings and illustrations, of all expenditures for artists' materials, electrotypes, and for the pay of such artists and engravers as it may be necessary to engage from time to time to supplement the work of those assigned to the several divisions.

In reference to the estimates submitted herewith for carrying on this division during the ensuing fiscal year, I desire to call attention to the following considerations: First, as to the name of the division. The present name is vague and misleading, the division having no more to do with records than any other division, and, as its work embraces a great deal more than is covered by the word editing, it is suggested that it be provided for hereafter as the division of publications. The increase in the work by the addition of duties, indicated above, and the extreme desirability of completing the descriptive catalogue of the publications of this Department from the beginning, and of at least initiating an index to the same, beginning with the Annual Report, have led me to propose the substitution of an editorial clerk of class 3 at $1,600 per annum, for one of the two clerks of class 1 provided under the present approriation. I have also estimated $3,000 as a suitable salary for the editor in chief and chief of division. This estimate is submitted without any reference to the deserts of the present chief, which are a matter for the consideration and judgment of his superior officers, but simply with the conviction that for the efficient discharge of the duties imposed upon him, and in view of the responsibilities of the position and of the experience, ability, and tact required, the sum mentioned for the remuneration of this officer is a very moderate one.

The usefulness and popularity of the farmers' bulletins, and the evident likelihood of an increase in the demand for this class of publications, justifies the recommendation of a sum of $50,000 for this purpose, particularly if the appropriation of this sum can be substituted for a seed distribution under the methods which have heretofore prevailed.

The work of illustrations and engravings has not been under my charge a sufficient time to enable me to furnish an estimate for the amount required for this department of the work. The estimate for next year is, therefore, left at the same figure as the appropriation for the current year. (Copies of the estimates for appropriations for the ensuing year and copies of the Secretary's orders of August 20 and 29, referred to above, are attached hereto; also a full list of the publications for the fiscal year.)

ESTIMATES, JULY 1, 1895, TO JUNE 30, 1896.

DIVISION OF PUBLICATIONS: For the pay of one editor and chief of division, $3,000; one assistant chief of division, $1,800; one editorial clerk, class 3, $1,600; one proof reader and indexer, clerk class 2, $1,400; and one clerk class 1, $1,200; in all, $9,000.

Publication of farmers' bulletins, Division of Publications.—For material, labor, traveling, and other necessary expenses in the preparation and for the publication and distribution of farmers' bulletins, $50,000: *Provided*, That said bulletins shall be adapted to the interest of different people of different sections of the country, and that an equal proportion of two-thirds of each bulletin shall be supplied to Senators, Representatives, and Delegates in Congress for distribution by them among their constituents by the same methods as have been heretofore adopted for the seed distribution, and that the Secretary of Agriculture shall notify Senators and Representatives of the character and number of each bulletin and of each other publication of the Department of Agriculture (not sent to the folding room of the Senate and House) to which each Senator and Representative may be entitled on the basis herein provided for the distribution of bulletins.

Printing labels, postal cards, circulars, etc., for labor and all necessary material, for printing presses and the repair of same, $6,000.

Illustrations and engravings.—For the pay of artists, draftsmen, and engravers, and one clerk at $1,000 per annum, the purchase of necessary material, and for expenses of reproduction, for electrotypes, and for traveling and other necessary expenses of illustration, $15,000.

ORDERS OF SECRETARY RELATING TO FARMERS' BULLETINS AND ILLUSTRATION AND ENGRAVING FUND.

U. S. DEPARTMENT OF AGRICULTURE, *August 20, 1894.*

DEAR SIR: You will have charge, under the general direction of the Assistant Secretary of Agriculture, of the printing, publishing, and distribution of the farmers' bulletins provided for in the act making appropriation for the Department of Agriculture, approved August 8, 1894. The full amount there appropriated, namely, $30,000, from the funds provided for the purchase and distribution of valuable seeds is hereby set aside for the preparation, printing, and publishing of farmers' bulletins to be distributed by Senators, Representatives, and Delegates in Congress to their constituents as seeds are distributed. You will "notify Senators and Representatives of the character and number of each bulletin and each other publication of the Department of Agriculture (not sent to the folding room of the Senate and House) to which each Senator and Representative may be entitled for distribution on the basis herein provided for the distribution of bulletins." You will ascertain, either by inquiry of the Senator or Representative, or in some other way, which bulletins are suitable for distribution in their respective districts, the pro rata number of each bulletin to which each Representative and Senator shall be entitled under the above appropriation, arranging, if possible, so that each one shall have at least four different bulletins for distribution each year.

The distribution of the bulletins will be through the folding room, as in case of other publications.

Respectfully,

J. STERLING MORTON,
Secretary.

Mr. GEO. WM. HILL,
Chief of Division of Records and Editing.

U. S. DEPARTMENT OF AGRICULTURE, *August 29, 1894.*

SIR: I have assigned to the Assistant Secretary full charge and control over the appropriation, under the act approved August 8, 1894, for illustrations and engravings, and I have instructed him that you have been detailed to assist him in such manner as he may direct in the administration of this fund, and you will therefore govern yourself accordingly.

Respectfully,

J. STERLING MORTON,
Secretary.

Mr. GEO. WM. HILL,
Chief of Division of Records and Editing.

PUBLICATIONS OF THE YEAR.

OFFICE OF THE SECRETARY.

	Copies.
Report of the Secretary of Agriculture for 1892. Pp. 656, illustrated. August, 1893	500,000
Report of the Secretary of Agriculture for 1893. (Preliminary report to the President.) Pp. 48. November, 1893	20,000
Reprint of same. April, 1894	2,500
Indian Corn (Maize) in the Manufacture of Beer. Pp. 21. September, 1893.	3,500
Reprint of same. December, 1894	1,500
German edition. Pp. 22. September, 1893	3,000
Special Report on Tea Raising in South Carolina. (From the Report of the Secretary of Agriculture for 1892.) Pp. 627–640, pls. 3. July, 1893	500
Farmers' Bulletin No. 13. Cranberry Culture. January, 1894	5,000
Report of the Assistant Secretary. Pp. 67-84. (From Report of the Secretary of Agriculture for 1892.) July, 1893	300
House Ex. Doc. No. 243. Letter from the Secretary of Agriculture, transmitting, in response to the resolution of the House of Representatives of January 22, 1894, a list of the special agents of the Department, together with a statement of their work and the salaries received, for the four years and six months ending December 31, 1893. Pp. 45. June, 1894	2,734
House Ex. Doc. No. 14. Letter from the Secretary of Agriculture, transmitting a detailed statement of expenditures of all appropriations for the Department of Agriculture for the fiscal year ending June 30, 1893. Pp. 208. December, 1894	1,734
Senate Mis. Doc. No. 41. Letter from the Secretary of Agriculture relative to the destruction and extermination of the noxious plant or weed known as "saltwort" or "Russian thistle." Pp. 5. January, 1894	1,734

DIVISION OF ACCOUNTS AND DISBURSEMENTS.

	Copies.
Regulations governing transactions with the United States Department of Agriculture, together with extracts from the Revised Statutes, decisions of Comptrollers, etc. Pp. 42. June, 1894	1,000

DIVISION OF AGRICULTURAL SOILS.

Circular No. 1. Announcement [relative to the functions of the Division of Agricultural Soils]. Pp. 3. April, 1894	1,000
Circular No. 2. Instructions for Taking Samples of Soil for Moisture Determinations. Pp. 3. May, 1894	1,000

BUREAU OF ANIMAL INDUSTRY.

Eighth and Ninth Annual Reports of the Bureau of Animal Industry for the years 1891 and 1892. Pp. 428, pls. 11, figs. 7. October, 1893	50,000
Bulletin No. 3. Special Report on Miscellaneous Investigations Concerning Infectious and Parasitic Diseases of Domesticated Animals. Pp. 88, pls. 3. November, 1893	3,000
Bulletin No. 5. Report on the Dairy Industry of Denmark. Pp. 133, figs. 33. January, 1894	10,000
Bulletin No. 4. A Revision of the Adult Cestodes of Cattle, Sheep, and Allied Animals. Pp. 134, pls. 16. January, 1894	3,000
Farmers' Bulletin No. 8. Results with Inoculation for the Prevention of Hog Cholera. Pp. 40. May, 1894. (Reprint)	2,500

DIVISION OF BOTANY.

Contributions from the United States National Herbarium, Vol. I, No. 7. Systematic and Alphabetic Index to New Species of North American Phanerogams and Pteridophytes published in 1892. Pp. iii, 233–263, iii. July, 1893	2,500
Contributions from the United States National Herbarium, Vol. I, No. 8. Notes on Some Pacific Coast Grasses; Descriptions of New or Noteworthy Grasses from the United States; Descriptions of New Grasses from Mexico; Description of New Plants from Texas and Colorado; List of Plants New to Florida; Descriptions of Three New Plants; Lists of Lichens from California and Mexico, collected by Dr. Edward Palmer from 1888 to 1892. Pp. iii, 265–292, ii, pls. 19–23. October, 1893	2,500
Contributions from the United States National Herbarium, Vol. IV. Botany of the Death Valley Expedition. A Report on the Botany of the Expedition sent out in 1891 by the United States Department of Agriculture to make a Biological Survey of the Region of Death Valley, California. Pp. viii, 361, pls. 21, 1 map. November, 1893	4,000
Contributions from the United States National Herbarium, Vol. II, No. 3. A Manual of the Phanerogams and Pteridophytes of Western Texas (Apetalæ, Monocotyledonæ, Pteridophytas). Pp. v, 347–588. May, 1894.	2,500
Contributions from the United States National Herbarium, Vol. III, No. 2. A Preliminary Revision of the North American Species of Cactus, Anhalonium, and Lophophora. Pp. iii, 132. June, 1894	2,500
Bulletin No. 15. The Russian Thistle: Its History as a Weed in the United States, with an Account of the Means Available for its Eradication. Pp. 32, pls. 3. June, 1894	20,000
Circular No. 1. Hungarian Brome Grass. Pp. 4. June, 1894	5,000

OFFICE OF EXPERIMENT STATIONS.

Bulletin No. 14. Proceedings of a Convention of the National League for Good Roads, held at Washington, D. C., January 17 and 18, 1893, and Hearing by the Committee on Agriculture of the House of Representatives, January 19, 1893. Pp. 101. July, 1893	5,000
Reprint of same. September, 1893	12,000
Bulletin No. 15. Handbook of Experiment Station Work. A Popular Digest of the Publications of the Agricultural Experiment Stations in the United States. Pp. 411. December, 1893	3,000
Reprint of same. March, 1894	5,000
Bulletin No. 16. Proceedings of the Sixth Annual Convention of the Association of American Agricultural Colleges and Experiment Stations, held at New Orleans, La., November 15–19, 1892. Pp. 176. September, 1893	4,000

	Copies.
Bulletin No. 17. Suggestions for the Establishment of Food Laboratories in Connection with the Agricultural Experiment Stations of the United States. Pp. 20. October, 1893	3,000
Experiment Station Record. (A condensed record of the contents of the bulletins and reports issued by the Agricultural Experiment Stations in the United States.)	
Vol. IV, No. 9. Pp. vii, 701–790. August, 1893	6,000
Vol. IV, No. 10. Pp. vii, 791–878. August, 1893	8,500
Vol. IV, No. 11. Pp. vii, 879–994. September, 1893	6,000
Vol. IV, No. 12 (index). Pp. 995–1086, xxx. December, 1893	6,000
Vol. V, No. 1. Pp. viii, 138. December, 1893	8,000
Vol. V, No. 2. Pp. viii, 139–268. January, 1894	8,000
Vol. V, No. 3. Pp. vii, 269–358. January, 1894	8,000
Vol. V, No. 4. Pp. vi, 359–452. January, 1894	8,000
Vol. V, No. 5. Pp. vi, 453–546. February, 1894	8,000
Vol. V, No. 6. Pp. viii, 547–666. March, 1894	8,000
Vol. V, No. 7. Pp. vi, 667–744. March, 1894	8,000
Vol. V, No. 8. Pp. vi, 745–830, figs. 12–19. April, 1894	8,000
Vol. V, No. 9. Pp. vii, 831–940, figs. 20, 21. May, 1894	8,000
Vol. V, No. 10. Pp. vii, 914–1040. June, 1894	8,000
Circular No. 23 of the Office of Experiment Stations. Key to Subject Index of Literature of Agricultural Experiment Stations and Kindred Institutions. Pp. 3. December, 1893	500
Circular No. 24 of the Office of Experiment Stations. Address List of the Agricultural Experiment Stations. P. 1. December, 1893	500
Bulletin No. 18. A Contribution to the Investigation of the Assimilation of Free Atmospheric Nitrogen by White and Black Mustard. Pp. 19, figs. 15. January, 1894	2,500
Farmers' Bulletin No. 14. Fertilizers for Cotton. Pp. 32. March, 1894	50,000
Reprint of same. April, 1894	15,000
Reprint of same. June, 1894	10,000
Bulletin No. 19. Organization Lists of the Agricultural Experiment Stations and Agricultural Schools and Colleges in the United States. Pp. 99. March, 1894	3,000
Farmers' Bulletin No. 16. Leguminous Plants for Green Manuring and for Feeding. Pp. 24. April, 1894	100,000
Farmers' Bulletin No. 9. Milk Fermentations and their Relations to Dairying. Pp. 24. (Reprint.) May, 1894	3,000
Circular No. 25. Canaigre. Pp. 4. June, 1894	2,000
Farmers' Bulletin No. 11. The Rape Plant: Its History, Culture, and Uses. Pp. 12, figs. 4. (Reprint.) August, 1893	10,000
Index cards [to experiment stations literature. Continuous publication]	3,481

DIVISION OF CHEMISTRY.

Bulletin No. 13, part 8. Food and Food Adulterants. Canned Vegatables. Pp. 1015–1167. August, 1893	10,000
Bulletin No. 38. Proceedings of the Tenth Annual Convention of the Association of Official Agricultural Chemists, held at Chicago, Ill., August 24, 25, and 26, 1893. Pp. 238. December, 1893	3,500
Bulletin No. 39. Experiments with Sugar Beets in 1893. Pp. 59. March, 1894	4,000
Reprint of same. April, 1894	1,200
Bulletin No. 40. Record of Experiments with Sorghum in 1893. Pp. 38. May, 1894	5,000
Farmers' Bulletin No. 12. Nostrums for Increasing the Yield of Butter. Pp. 16. (Reprint.) September, 1893	10,000

DIVISION OF ENTOMOLOGY.

Bulletin No. 31. Catalogue of the Exhibit of Economic Entomology at the World's Columbian Exposition, Chicago, Ill., 1893. Made under the direction of the Entomologist. Pp. 121. August, 1893	3,000
Reprint of same. August, 1893	3,000
Insect Life. (Devoted to the economy and life habits of insects, especially in their relation to agriculture, and edited by the Entomologist and his assistants.) Vol. V, No. 5. Pp. iii, 289–402, pls. 2, 3, figs. 38–47, with index and contents (pp. vii) to Vol. V. August, 1893	5,500
Vol. VI, No. 1. Pp. iii, 58, fig. 1. November, 1893	5,500
Vol. VI, No. 2. Pp. iii, 59–206, figs. 2–5. December, 1893	5,000

	Copies.
Insect Life—Continued.	
Vol. VI, No. 3. Pp. iii, 207-282, figs. 6-11. February, 1894	5,500
Vol. VI, No. 4. Pp. iii, 283-346, figs. 12-22. May, 1894	5,500
Report of the Entomologist for 1892. (From the Report of the Secretary of Agriculture for 1892.) Pp. iii, 153-180, ii, pls. 12. July, 1893	500
Circular No. 3, second series. An Important Enemy of Fruit Trees. Pp. 10, figs. 5. April, 1894	17,500
Bulletin No. 21. Report of a Trip to Australia, made under the Direction of the Entomologist to Investigate the Natural Enemies of the Fluted Scale. Pp. 32, figs. 16. (Reprint.) March, 1894	500
Bulletin No. 25. Destructive Locusts. A Popular Consideration of a few of the More Injurious Locusts (or "Grasshoppers") of the United States, together with the Best Means of Destroying Them. Pp. 62, pls. 12, figs. 11. (Reprint.) September, 1893	5,000
Bulletin No. 17. The Chinch Bug: A General Summary of Its History, Habits, Enemies, and of the Remedies and Preventives to be Used Against It. Pp. 48, figs. 10. (Reprint.) February, 1894	3,000

OFFICE OF FIBER INVESTIGATIONS.

Fiber Report No. 2. Recent Facts Regarding the Ramie Industry in America. Pp. 16. (Reprint)	1,000
Fiber Report No. 5. A Report of the Leaf Fibers of the United States, Detailing Results of Recent Investigations Relating to Florida Sisal Hemp, the False Sisal Hemp Plant of Florida, and Other Fiber-producing Agaves; Bowstring Hemp, Pineapple Fiber, New Zealand Flax, and Bear Grass. Pp. 73, pls. 10, figs. 12. July, 1893	8,000

DIVISION OF FORESTRY.

Report of the Chief of the Division of Forestry for 1892. (From the Report of the Secretary of Agriculture for 1892.) Pp. iii, 293-358, pls. 6, diagram 1. July, 1893	10,000
Bulletin No. 4. Report on the Substitution of Metal for Wood in Railroad Ties; Together with a Discussion of Practicable Economies in the Use of Wood for Railway Purposes. Pp. 363, pls. 30. (Reprint.) May, 1894.	1,000
Bulletin No. 7. Forest Influences. Contents: Introduction and Summary of Conclusions; Review of Forest Meteorological Observations; A Study Preliminary to the Discussion of the Relation of Forests to Climate; Relation of Forests to Water Supplies; Notes on the Sanitary Significance of Forests. Appendices: Determination of the True Amount of Precipitation and Its Bearing on Theories of Forest Influences; Analysis of Rainfall with Relation to Surface Conditions. Pp. 197, figs. 63. (Reprint.) August, 1893	4,750

OFFICE OF IRRIGATION INQUIRY.

Bulletin No. 1. Abstract of the Laws of the Several States and Territories on Irrigation and Water Rights. Pp. 180. September, 1893	2,500

LIBRARY.

Bulletin No. 1, April, 1894. Accessions to the Department Library. Pp. 12. Quarto. May, 1894	750

DIVISION OF MICROSCOPY.

Food Products—II. Eight Edible and Twelve Poisonous Mushrooms of the United States, with Directions for the Culture and Culinary Preparation of the Edible Species. Pp. 22, pls. 6. January, 1894	10,000
Food Products—III. (1) Improved methods of Distinguishing between Pure and Fictitious Lard. (2) Four Edible Mushrooms of the United States. Pp. 22, pls. 6. January, 1894	10,000
Food Products—I. Twelve Edible Mushrooms of the United States, with Directions for Their Identification and Their Preparation as Food. Pp. 23. (Reprint.) April, 1894	10,000

DIVISION OF ORNITHOLOGY AND MAMMALOGY.

Bulletin No. 4. The Prairie Ground Squirrels or Spermophiles of the Mississippi Valley. Pp. 69, pls. 3. October, 1893	5,000

	Copies.
Report on the Ornithology of the Death Valley Expedition of 1891, Comprising Notes on the Birds Observed in Southern California, Southern Nevada, and Parts of Arizona and Utah. (From North American Fauna No. 7.) Pp. 7-158, 1 map. July, 1893	150
Annotated List of the Reptiles and Batrachians Collected by the Death Valley Expedition in 1891, with Descriptions of New Species. (From North American Fauna No. 7.) Pp. 159-228, pls. 4. July, 1893	150
Report on the Fishes of the Death Valley Expedition Collected in Southern California and Nevada in 1891, with Descriptions of New Species. (From North American Fauna No. 7.) Pp. 229-234, pls. 5, 6. July, 1893	150
Report on a Small Collection of Insects made During the Death Valley Expedition; List of Diptera from Death Valley, California, and Adjoining Regions; Hemiptera and Heteroptera of the Death Valley Expedition. (From North American Fauna No. 7.) Pp. 235-268. July, 1893	150
Report on the Land and Fresh-water Shells Collected in California and Nevada by the Death Valley Expedition, Including a Few Additional Species Obtained by Dr. C. Hart Merriam and Assistants in Parts of the Southwestern United States. (From North American Fauna No. 7.) Pp. 269-283. July, 1893	150
Notes on the Distribution of Trees and Shrubs in the Deserts and Desert Ranges of Southern California, Southern Nevada, Northwestern Arizona, and Southwestern Utah; Notes on the Geographic and Vertical Distribution of Cactuses, Yuccas, and Agave in the Deserts and Desert Ranges of Southern California, Southern Nevada, Northwestern Arizona, and Southwestern Utah. (From North American Fauna No. 7.) Pp. 285-359, pls. 9, maps 4. July, 1893	150
List of Localities in California, Nevada, and Utah Visited by the Death Valley Expedition of 1891. (From North American Fauna No. 7.) Pp. 361-384, 1 map. July, 1893	150
Report of the Ornithologist and Mammalogist for 1892. (From the Report of the Secretary of Agriculture for 1892.) Pp. 181-200, pls. 5. August, 1893	500

POMOLOGY.

Fruit Crop Prospects in the United States. (Reprint of pp. 251-253 of Statistical Report No. 115.) May, 1894	1,500

DIVISION OF RECORDS AND EDITING.

List of Publications of the United States Department of Agriculture for the Five Years 1889-1893. Pp. 42. May, 1894	2,500

OFFICE OF ROAD INQUIRY.

Bulletin No. 1. State Laws Relating to Management of Roads. Enacted in 1888-1893. Pp. 95. January, 1894	3,000
Reprint of same, February, 1894	3,000
Bulletin No. 2. Proceedings of the Minnesota Good Roads Convention held at St. Paul, Minn., January 25, 26, 1894. Pp. 16. March, 1894	5,000
Bulletin No. 3. Improvement of the Road System of Georgia. Pp. 31, figs. 5. April, 1894	5,000
Bulletin No. 4. Report on Road-making Materials in Arkansas. Pp. 11. April, 1894	5,000
Bulletin No. 5. Information Regarding Road Materials and Transportation Rates in Certain States West of the Mississippi River. Pp. 24, maps 4. June, 1894	5,000
Bulletin No. 6. Information Regarding Roads, Road Materials, and Freight Rates in Certain States North of the Ohio River. Pp. 30, maps 7. June, 1894	5,000
Bulletin No. 8. Earth Roads: Hints on their Construction and Repair. Pp. 20. June, 1894	10,000

DIVISION OF STATISTICS.

Report No. 106. Report of the Statistician, July, 1893. Contents: Crop Report for July; Statistics of Ontario; Foreign Import Duties on Wheat; Notes on Foreign Agriculture; Use of Maize of the United States in Mexico; Transportation Rates. Pp. 223-270	20,000

Copies.

Report No. 107. Report of the Statistician, August, 1893. Contents: Crop Report for August; Notes on Foreign Agriculture; Wheat Crop of India for 1893; Production of Corn in New South Wales; Domestic and Transatlantic Freight Rates. Pp. 271–322 20,000

Report No. 108. Report of the Statistician, September, 1893. Contents: September Crop Report; Agricultural Returns of Great Britain; Ontario Crop Report; Crops in Germany; Notes from United States Consular Officers in Scotland, France, Germany, Belgium, Cochin-China, and Ontario; Domestic and Transatlantic Freight Rates. Pp. 323–369 20,000

Report No. 109. Report of the Statistician, October, 1893. Contents: October Crop Report; Notes from Reports of State Agents; Imports of Hay into the United Kingdom; Cereal Crops of France and Italy for 1893; Citrus Fruit Crop in Italy for 1892–93; Production, Commerce, and Consumption of Wine in Italy; Corn as Feed for Horses in Germany; Reports from Consular Officers Relating to Crops in Germany, Scotland, New Brunswick, and Ontario; Domestic and Transatlantic Freight Rates. Pp. 371–414 20,000

Report No. 110. Report of the Statistician, November, 1893. Contents: November Crop Report; Notes from Reports of State Agents; Imports of American Wheat Flour into Europe; The Hop Crop of England for 1893; the Beet-Sugar Production of Europe for the year 1893–94; Agriculture in Great Britain and Ireland; Notes from United States Consular Officers Relating to crops in Ontario, Spain, Cochin-China, Korea, Scotland, and Egypt; Domestic and Transatlantic Freight Rates. Pp. 415–458 18,000

Report No. 111. Report on the Crops of the Year, December, 1893. Pp. 459–521 18,000

Report No. 112. Report of the Statistician, January–February, 1894. Contents: Report on Farm Animals; Notes from Reports of State Agents; The Cotton Crop; Agriculture in China; The Sugar Crop of the World; Germany as an Importer of American Agricultural Products; The Canning Industry; Notes on Foreign Agriculture; Domestic and Transatlantic Freight Rates. Pp. 68 18,500

Report No. 113. Report of the Statistician, March, 1894. Contents: Distribution and Consumption of Corn and Wheat; Supply and Distribution of Wheat for Twenty-five Years; The Wheat Crop of the World; Wholesale Prices of Principal Agricultural Products in All Sections of the United States; Expense of Raising Wheat and Corn; Production of Honey and Beeswax; Poultry and Eggs; Dairy Products; Official Statistics of Foreign Crops; The World's Supply of Wool; Notes from United States Consular Officers and European Agents; Domestic and Transatlantic Freight Rates. Pp. 69–156 18,000

Report No. 114. Report of the Statistician, April, 1894. Contents: Condition of Winter Grain; Wheat Production in Census Years Since 1869; Farm Animals—Condition and Losses; Increase and Decrease in the Number and Value of Farms, 1880–1890; Agricultural Development in Bosnia and Herzegovina; Health of the People; The Cotton Crop of India for the Year 1893–94; Reports of United States Consular Officers; Transportation Rates. Pp. 157–218 18,000

Report No. 115. Report of the Statistician, May, 1894. Contents: Temperature and Rainfall; Condition of Winter Grain; Changes in Crop Area; The World's Supply and Consumption of Cotton; Fruit Crop Prospects in the United States, May 1, 1894; Agricultural Production of Mexico for 1889 and 1892; Agricultural Statistics of Uruguay; Austrian Cereal Crops for 1893; European Crop Report; Notes from United States Consular Officers; Transportation Rates. Pp. 219–294 19,500

Report No. 116. Report of the Statistician, June, 1894. Contents: Crop Report for June; Tariff Rates on Principal Cereals and Flour in European Countries; Notes on Foreign Agriculture; Notes from United States Consular Officers; The Climate of Mexico; Mexican Railways; Transportation Rates. Pp. 295–394 19,500

Monthly Crop Synopsis. (A four-page summary of the condition, prospects, yields, price, distribution, and consumption of crops, and the number and value of farm animals. Issued soon after the 10th of each month for prompt and wide circulation in advance of the more extended monthly crop report from which it is condensed).

- July Synopsis. (From Statistical Report No. 106) 122,700
- August Synopsis. (From Statistical Report No. 107) 122,700
- September Synopsis. (From Statistical Report No. 108) 126,700
- October Synopsis. (From Statistical Report No. 109) 126,700

	Copies.
Monthly Crop Synopsis—Continued.	
November Synopsis. (From Statistical Report No. 110)	126,700
December Synopsis. (From Statistical Report No. 111)	126,700
January Synopsis	128,000
February Synopsis. (From Statistical Report No. 112)	126,000
March Synopsis. (From Statistical Report No. 113)	126,700
April Synopsis. (From Statistical Report No. 114)	126,700
May Synopsis. (From Statistical Report No. 115)	126,700
June Synopsis. (From Statistical Report No. 116)	126,700
Report No. 8. Miscellaneous Series. Recent Features of Our Foreign Trade. Pp. 24. January, 1894	2,500

DIVISION OF VEGETABLE PATHOLOGY.

Bulletin No. 4. Experiments with Fertilizers for the Prevention and Cure of Peach Yellows, 1889–1892. Pp. 197, pls. 33. July, 1893	5,000
Report of the Chief of the Division of Vegetable Pathology for 1892. (From the Report of the Secretary of Agriculture for 1892.) Pp. 215–246, pls. 4. July, 1893	500
Experiments in Preventing Leaf Diseases of Nursery Stock in Western New York. (From the Journal of Mycology, Vol. VII, No. 3.) Pp. 240–264, pls. 21–29, diagrams, 2. July, 1893	500
Circular No. 13 of the Division of Vegetable Pathology. Circular of inquiry relative to "Leaf Curl" of Peach Trees. Pp. 3, letter size. December, 1893	3,000
Farmers' Bulletin No. 15. Some Destructive Potato Diseases: What They Are and How to Prevent Them. Pp. 8, figs. 3. April, 1894	5,000
Bulletin No. 5. The Pollination of Pear Flowers. Pp. 110, pls. 12, figs. 5. April, 1894	5,000
Farmers' Bulletin No. 4. Fungous Diseases of the Grape and Their Treatment. Pp. 12. (Reprint.) May, 1894	3,000
Farmers' Bulletin No. 5. Treatment of Smuts of Oats and Wheat. Pp. 8, pl. 1. (Reprint.) May, 1894	5,000
Farmers' Bulletin No. 17. Peach Yellows and Peach Rosette. Pp. 20, fig. 7. June, 1894	15,000

WEATHER BUREAU.

Weather Bureau Bulletin No. 9. Report on the Forecasting of Thunderstorms During the Summer of 1892. Pp. 54, charts 6. July, 1893	5,000
Weather Bureau Bulletin No. 10. The Climate of Chicago. Pp. 137, figs. 26. August, 1893	5,000
Bulletin A of the Weather Bureau. Summary of International Meteorological Observations. Size 19 by 24 inches. Pp. 10, charts 61. August, 1893.	500
Monthly Weather Review. (A summary, by months, of weather conditions throughout the United States, based upon reports of nearly 3,000 regular and voluntary observers. Size, quarto.)	
Vol. XXI, No. 5, May, 1893. Pp. 123–152, charts 6	3,680
Vol. XXI, No. 6, June, 1893. Pp. 153–178, charts 5	3,680
Vol. XXI, No. 7, July, 1893. Pp. 179–204, charts 5	3,680
Vol. XXI, No. 8, August, 1893. Pp. 205–240, charts 5	4,188
Vol. XXI, No. 9, September, 1893. Pp. 241–267, charts 6	3,731
Vol. XXI, No. 10, October, 1893. Pp. 268–308, charts 6	3,825
Vol. XXI, No. 11, November, 1893. Pp. 309–342, charts 7	3,825
Vol. XXI, No. 12, December, 1893. Pp. 343–376, charts 7	3,575
Vol. XXII, No. 1, January, 1894. Pp. 44, charts 6	3,575
Vol. XXII, No. 2, February, 1894. Pp. 47–97, charts 6	3,600
Vol. XXII, No. 3, March, 1894. Pp. 98–147, charts 8	3,275
Vol. XXII, No. 4, April, 1894. Pp. 148–192, charts 5	3,050
Report of the Chief of the Weather Bureau, 1891–92. (Devoted chiefly to tables recording climatological data for the years 1891 and 1892.) Quarto, pp. 528, pls. 4, figs. 23. December, 1893	9,000
Parts I to VI, inclusive, of the Report of the Chief of the Weather Bureau, 1891–92, printed separately. Quarto.	
Part I. Contents: Introduction; List of Observing Stations; Description of Instruments, and Instrumental Corrections; Methods of Reduction. Pp. 7–48, figs. 22. December, 1893	1,000
Part II. Contents: Hourly Averages of Atmospheric Pressure, Temperature, and Wind from the Records of Self-recording Instruments at Twenty-eight Stations. Pp. 49–139. December, 1893	1,000

	Copies.
Parts I to VI, inclusive, of Report of Chief of the Weather Bureau—Cont'd.	
Part III. Contents: Monthly and Annual Mean Meteorological Summaries for Weather Bureau Stations. Pp. 141–303. December, 1893	1,000
Part IV. Contents: Monthly and Annual Mean Temperature and Annual Extremes of Temperature, together with the Dates of First and Last Killing Frost. Pp. 305–365. December, 1893	1,000
Part V. Contents: Monthly and Annual Precipitation—All Stations. Pp. 367–433. December, 1893	1,000
Part VI. Contents: Miscellaneous Meteorological Tables and Reports. Pp. 435–528, pls. 4, fig. 22. December, 1893	1,000
Report of the Chief of the Weather Bureau for 1892. (From the Report of the Secretary of Agriculture for 1892.) Pp. iv, 551–626, ii, pls. 4. July, 1893	9,000
Instruction for Using Marvin's Weighing Rain and Snow Gauge. Circular E, Instrument Room. Pp. 16, figs. 5. October, 1893	500
Instructions to Special Rainfall Observers of the Weather Bureau. Pp. 22. November, 1893	300
Rainfall Laws: Deduced from Twenty Years of Observation. Pp. 94, figs. 16. December, 1893	100
Circular of the Weather Bureau. International Meteorological Symbols. Pp. 5. February, 1894	3,800
Bulletin No. 11. Report of the International Meteorological Congress, held at Chicago, Ill., August 21–24, 1893, under the Auspices of the Congress Auxiliary of the World's Columbian Exposition. Part I. Pp. 206, pls. 10. March, 1894	500
Bulletin B. Currents of the Great Lakes, as Deduced from the Movements of Bottle Papers during the Seasons of 1892 and 1893. Pp. 6, charts 6. Size 18½ by 24 inches. March, 1894	5,000
Miscellaneous Report. Report of Wrecks on the Great Lakes from December 17, 1885, to November 15, 1893. Pp. 22. June, 1894	2,000
Weather Crop Bulletin. (A brief summary of the condition of weather and crops of the United States, showing by maps and tables the departures from normal temperature and rainfall for the period covered by the bulletin. Issued from July 5, 1893, to June 26, 1894, inclusive, a separate monthly edition being continued throughout the year, and all issues being numbered consecutively for the calendar year in the order of their appearance. Uniform with weather map in size and form.) Thirty-two numbers. Total issue	87,713
Circular of Information. Protection from Lightning. Pp. 20, figs. 21. May, 1894	5,000
Reprint of same. July, 1894	20,000
Instructions for Voluntary Observers. Pp. 100, figs. 21. (Reprint.) November, 1893	5,000

REPORT OF THE FOREMAN OF THE PRINTING OFFICE.

SIR: I have the honor to submit my report as foreman of the printing office from the date of my taking charge in November, 1893, to the end of the fiscal year, June 30, 1894.

GEORGE D. SKINNER,
Foreman.

Hon. J. STERLING MORTON,
Secretary.

The records of this office in November, 1893, the date on which I took charge, show no account of work done previous to July 1, 1893. Comparison of work of the fiscal year 1894 with the work done in the fiscal year 1893 can not therefore be made. During the four months previous to November, 1893, the force in the office numbered 17 regular employees. In that month this force was reduced to 7 regular employees, and 8 persons have been temporarily employed seven months.

The following table shows the work done by these employees from July 1, 1893, to June 30, 1894:

Month.	Number of impressions.						
	Miscellaneous job printing.	Letter heads and note heads.	Envelopes.	Vegetable-seed pockets.	Flower-seed pockets.	Labels.	Total.
July	42,050	9,600	8,000	.....	.....	.....	59,650
August	38,350	18,200	53,000	1,000,000	.....	.....	1,109,550
September	80,300	16,250	40,700	320,700	.....	.....	457,950
October	74,690	6,500	273,050	2,062,600	.....	.....	2,416,840
November	46,137	26,000	455,200	1,967,425	.....	24,000	2,518,762
December	682,845	7,000	12,250	861,800	.....	13,000	1,576,895
January	102,275	11,750	363,200	50,000	.....	35,400	562,625
February	1,647,770	7,500	27,500	179,300	240,100	6,200	2,108,370
March	603,900	16,500	1,298,000	607,300	475,900	3,300	3,004,900
April	210,700	7,500	59,050	227,550	57,400	800	563,000
May	104,950	18,500	89,950	.....	28,700	.....	242,100
June	191,055	13,700	61,000	.....	.....	.....	265,755
	3,825,022	159,000	2,740,900	7,276,675	802,100	82,700	14,886,397

REPORT OF THE CHIEF OF THE SEED DIVISION.

SIR: I have the honor to submit herewith a report of the operations of the Seed Division for the fiscal year ending June 30, 1894.

Very respectfully, M. E. FAGAN,
Chief.

Hon. J. STERLING MORTON,
Secretary.

RECORD OF SEED DISTRIBUTED.

The following tables show the number of papers of seed distributed during the fiscal year ending June 30, 1894, together with the kinds and varieties, and the persons or associations to whom such distribution was made:

Table showing seeds sent to Senators, Representatives, and Delegates in Congress, July 1, 1893, to July 1, 1894.

Vegetable	papers..	7,440,918
Flower	do....	640,065
Tobacco	do....	63,746
Oats	quarts..	50
Sorghum	do....	25
Corn	do....	11,706
Grass	do....	10,166
Clover	do....	9,293
Cotton	do....	21,166
Turnip	papers..	182,542
Sugar beet	quarts..	521
Rutabaga	papers..	35
Mangel-wurzel	quarts..	14
Rape	do....	4,873

Tabulated statement showing the kinds and quantities of seed issued under the general appropriation act of Congress from July 1, 1893, to June 30, 1894.

Description of seeds.	Varieties.	Senators, Representatives, and Delegates in Congress.	County statistical correspondents.	State statistical agents.	Experiment stations and experimental farmers.	Agricultural associations and miscellaneous applicants.	Total.
		Packages.	*Packages.*	*Packages.*	*Packages.*	*Packages.*	*Packages.*
Vegetable	177	7,440,918	206,795	67,465	29,818	382,017	8,127,013
Flower	65	640,065	94,105	17,550	.....	50,382	802,102
Tobacco	7	63,746	80	.....	2,350	1,721	67,897
Wheat	1	.....	1,698	.....	.....	124	1,822
Corn	5	11,706	2,502	.....	3	1,741	15,952
Oats	3	50	1,149	.....	.....	3,606	4,805
Barley	1	.....	1,442	.....	.....	108	1,550
Grass	5	10,166	25	3	362	1,939	12,495
Clover	4	9,293	22	5	2,501	626	12,447
Sorghum	6	25	.....	.....	.....	2,416	2,441
Kaffir corn	1	.....	5	.....	639	11	655
Jerusalem corn	1	.....	.....	.....	722	2	724
Millo maize	2	.....	.....	.....	414	.....	414
Soja beans	2	.....	.....	.....	.....	10	10
Cowpeas	1	.....	2	.....	956	58	1,016
Flat peas	1	.....	.....	.....	269	8	277
Serradella	1	.....	.....	.....	155	7	162
Spurry	1	.....	.....	5	473	34	512
Hairy vetch	1	.....	.....	.....	189	5	194
Rape	1	4,873	610	.....	1,224	192	6,899
Turnip	8	182,577	196,163	56,100	.....	17,912	452,752
Sugar beet	3	521	19	.....	1,265	5,222	7,027
Mangel-wurzel	1	14	5	1	.....	469	489
Peanuts	1	.....	.....	.....	675	38	713
Cotton	10	21,166	3,039	.....	10,213	532	34,950
		8,385,120	507,661	141,129	52,228	469,180	9,555,318

A statement showing the kinds and number of papers of seed sent to foreign countries during the fiscal year ended June 30, 1894.

Countries.	Vegetable.	Flower.	Tobacco.	Wheat.	Corn.	Oats.	Barley.	Grass.	Clover.	Cotton.	Mangel-Wurzel.
Bolivia	25										1
Canada	5	15									
Chile	40				2				4		
China	292										
Colombia	40	5									
Korea	27										
Costa Rica	30		10								
Ecuador						1		1			
Germany	10	10						2	1		
Guatemala	8									1	
Japan				1			1			2	
Mexico	10	10									
Natal	10										
Nicaragua	10										
Philippine Islands	10	10									
Venezuela	10										
Total	527	50	10	1	2	1	1	3	5	3	1

Cost of distribution.

Expended from the appropriation for the purchase and distribution of seeds	$111,242.51	
Expended for statutory salaries	12,400.00	
		$123,642.51
Divided as follows:		
For seed	56,968.66	
For express and freight charges	2,858.97	
For grain bags	182.08	
For salary and expenses of special agent	3,010.59	
Total cost of seed delivered		63,020.30
For labor in seed room (laborers' roll)	34,690.75	
For skilled labor	5,643.99	
For paper bags, twine, tags, and other supplies	7,887.47	
For statutory salaries	12,400.00	
		60,622.21

Relative cost of seed, labor, and distribution.

	Cents.
Cost per paper of seed distributed	1.29
Cost per paper of seed alone	.65
Cost per paper of putting up seed	.51
Cost per paper of clerical work	.13

Comparative statement of expenditures for years 1892-93 and 1893-94.

Fiscal year.	Number of packages of seed distributed.	For seeds.	For supplies.	For labor in seed room.	For skilled labor.	For clerical roll.	For bulbs and cuttings.	Total of expenditures.
1892-93	7,704,464	$71,434.00	$9,910.00	$39,167.00	$4,489.00	$30,000.00	$5,000.00	$160,000.00
1893-94	9,555,318	63,020.00	7,887.00	34,691.00	5,644.00	12,400.00	4,066.00	127,708.00

REPORT OF THE CHIEF OF THE DIVISION OF ACCOUNTS AND DISBURSEMENTS.

SIR: I have the honor to transmit herewith a concise report of the work of the Division of Accounts and Disbursements for the fiscal year ending June 30, 1894.

Very respectfully, F. L. EVANS,
Chief.

Hon. J. STERLING MORTON, *Secretary.*

WORK OF THE YEAR.

Exclusive of the sum of $720,000 appropriated for the agricultural experiment stations and payable thereto directly from the United States Treasury, the appropriation to defray the expenses of the United States Department of Agriculture for the above fiscal year was $2,603,500. Of this amount $1,790,530.70 were disbursed prior to July 1, 1894. In addition to this sum there were unpaid bills on that date aggregating about $200,000, that will further add to the expenditures, and will appear in the supplemental account for 1894. After the accounts are finally adjusted there will be in round numbers $600,000 to cover back into the United States Treasury, or about 23 per cent of the total appropriation.

The following table shows the various sums appropriated, the amounts disbursed during the year, and the unexpended balances July 1, 1894, by appropriations:

Table showing appropriations for the fiscal year 1894, amounts disbursed during the year, and unexpended balances, July 1, 1894.

Appropriations, 1894.	Amounts appropriated.	Amounts disbursed.	Amounts unexpended.
Salaries	$256,800.00	$233,679.75	$23,120.25
Collecting agricultural statistics	110,000.00	90,123.33	19,876.67
Botanical investigations and experiments	30,000.00	23,120.26	6,879.74
Investigating the history and habits of insects	20,300.00	15,935.76	4,364.24
Investigations in ornithology, etc	17,500.00	14,400.30	3,099.70
Pomological information	5,000.00	4,170.36	829.64
Microscopical investigations	2,000.00	855.74	1,144.26
Vegetable pathological investigations, etc	20,000.00	16,662.49	3,337.51
Laboratory	21,900.00	9,478.06	12,421.94
Fiber investigations	5,000.00	2,339.22	2,660.78
Report on forestry	20,000.00	18,897.20	1,102.80
Illustrations and engravings	2,000.00	593.09	1,406.91
Purchase and distribution of valuable seeds	135,400.00	119,406.95	15,993.05
Document and folding room	2,000.00	1,662.81	337.19
Experimental gardens and grounds	31,500.00	26,400.63	5,099.37
Museum	4,000.00	2,777.22	1,222.78
Furniture, cases, and repairs	10,000.00	8,116.66	1,883.34
Library	3,000.00	2,028.91	971.09
Postage	5,000.00	1,375.00	3,625.00
Contingent expenses	25,000.00	19,149.21	5,850.79
Agricultural experiment stations	25,000.00	21,481.80	3,518.20

Table showing appropriations for the fiscal year 1894, etc.—Continued.

Appropriations, 1894.	Amounts appropriated.	Amounts disbursed.	Amounts unexpended.
Inquiries relating to public roads	$10,000.00	$2,848.23	$7,151.77
Experiments in the manufacture of sugar	20,000.00	8,504.28	11,495.72
Irrigation investigations	6,000.00	5,261.02	738.98
Quarantine stations for neat cattle	15,000.00	5,482.97	9,517.03
Bureau of Animal Industry	850,000.00	457,860.54	392,139.46
Total	1,652,400.00	1,112,611.79	539,788.21
WEATHER BUREAU.			
Salaries	179,530.00	152,697.88	26,832.12
Fuel, lights, and repairs	9,700.00	7,152.48	2,547.52
Contingent expenses	13,700.00	3,623.67	10,076.33
General expenses	404,170.00	203,517.77	200,652.23
General expenses, salaries	344,000.00	310 927.11	33,072.89
Total, Weather Bureau	951,100.00	677,918.91	273,181.09
Grand total	2,603,500.00	1,790,530.70	812,969.30

For the last fiscal year 31 specific appropriations were made, as shown in the above table, together with 15 subappropriations, requiring separate and distinct accounts to be kept, demanding great care and accuracy in the system of bookkeeping.

During the fiscal year 1894, 11,863 accounts were received, audited, and paid, including supplemental to 1893, amounting to $1,967,842.79. Ninety-three requisitions were drawn on the United States Treasury for the payment of these accounts, aggregating $2,014,809.95. There were drawn in settlement 19,100 checks, exclusive of about $450,000 paid in currency over the counter.

There were issued during the year 3,943 requisitions for the purchase of annual supplies, exclusive of letters which may have authorized expenditures.

MONEYS RECEIVED FROM VARIOUS SOURCES.

During the same period fifty-nine separate amounts were received from various sources from the sale of condemned Government property and deposited in the United States Treasury to the credit of "miscellaneous receipts," as provided by law, aggregating $2,708.98. There was also received from the sale of "card index," in twenty-three remittances, and deposited to the credit of appropriation for agricultural experiment stations, 1894, the sum of $223.50. Also one amount of $107.33 received from sale of "products" in experiments in the manufacture of sugar, 1894, and deposited as required by appropriation act. From sale of maps and bulletins, as allowed by act of Congress approved March 30, 1874, $171.26, in forty-seven remittances, and deposited to the credit of the appropriation general expenses, Weather Bureau, 1894. Total from seacoast telegraph lines, in four hundred and two sums, aggregating $3,923.93. All moneys paid for messages transmitted over the United States seacoast telegraph lines in Massachusetts, Rhode Island, Virginia, North Carolina, Florida, Oregon, and Washington are remitted to the accounts division, Weather Bureau. Operators are required to make returns promptly whenever the cash on hand aggregates $20. All accounts of operators with each other, and between the seacoasts and commercial lines, are audited by the telegraph division of the Weather Bureau. After adjusting and settling the amounts found to be due the Weather Bureau from the commercial lines, or vice versa, *the Government's* proportion of the receipts is deposited in the United

States Treasury, and proper accounts rendered monthly to the First Auditor through this office.

Recapitulation of moneys received.

Condemned property	$2,708.98
Card index	223.50
Sugar experiments	107.33
Publications	171.26
United States seacoast telegraph line receipts	3,923.93
Total	7,135.00

REDUCTION OF EXPENDITURES.

By comparison, as shown in the accompanying statement, it will be seen that there was a reduction in the aggregate expenditures for the twelve months ending June 30, 1894, over the corresponding period for 1893, of $386,364.83, or an average monthly reduction of $32,197.07, representing a net saving of 14.8 per cent of the total sum appropriated, as compared with the expenditures of the preceding year. It is fully manifest, and it may be proper to state, that this large reduction in the expenditures of the Department is the result of a rigid enforcement of the economic policy inaugurated by the present administration of the Department, and has been effected without detriment to the public service.

Table showing appropriations for fiscal years 1893 and 1894, together with amounts disbursed on each.

Appropriations.	Amounts appropriated for—		Amounts disbursed for 1893.	Amounts disbursed for 1894.
	1893.	1894.		
Salaries	$256,800.00	$256,800.00	$253,896.80	$233,679.75
Collecting agricultural statistics	110,000.00	110,000.00	92,542.72	90,123.33
Botanical investigations, etc	29,500.00	30,000.00	26,269.66	23,120.26
Investigating the history and habits of insects	17,800.00	20,300.00	15,852.10	15,935.76
Investigations in ornithology, etc	15,000.00	17,500.00	14,606.60	14,400.39
Pomological information	5,000.00	5,000.00	4,573.14	4,170.36
Microscopical investigations	2,000.00	2,000.00	1,176.46	855.74
Vegetable pathological investigations, etc	20,000.00	20,000.00	19,331.43	16,662.49
Laboratory	19,400.00	21,900.00	16,586.47	9,478.06
Fiber investigations	5,000.00	5,000.00	4,642.92	2,339.22
Report on forestry	12,000.00	20,000.00	11,842.14	18,897.20
Illustrations and engravings	2,000.00	2,000.00	1,696.03	593.09
Purchase and distribution of valuable seeds	135,400.00	135,400.00	134,773.74	119,406.95
Document and folding room	2,000.00	2,000.00	1,438.55	1,662.81
Experimental gardens and grounds	28,500.00	31,500.00	28,138.19	26,409.63
Museum	4,000.00	4,000.00	3,967.07	2,777.22
Furniture, cases, and repairs	10,000.00	16,000.00	8,170.61	8,116.66
Library	3,000.00	3,000.00	2,377.22	2,028.91
Postage	5,000.00	5,000.00	3,705.00	1,375.00
Contingent expenses	25,000.00	25,000.00	20,637.17	19,149.21
Agricultural experiment stations	20,000.00	25,000.00	18,017.61	21,481.80
Inquiries relating to public roads	.....	10,000.00	.....	2,848.23
Experiments in the manufacture of sugar	20,000.00	20,000.00	19,356.52	8,504.28
Irrigation investigations	6,000.00	6,000.00	4,888.12	5,261.02
Quarantine stations for neat cattle	15,000.00	15,000.00	11,411.67	5,482.97
Experiments in the production of rainfall	10,000.00	.....	4,882.79	.....
Bureau of animal industry	850,000.00	850,000.00	678,907.36	457,860.54
Total	1,628,400.00	1,652,400.00	1,403,676.89	1,112,611.79
WEATHER BUREAU.				
Salaries	176,395.22	179,530.00	172,579.48	152,697.88
Fuel, lights, and repairs	9,700.00	9,700.00	8,049.73	7,152.48
Contingent expenses	13,700.00	13,700.00	10,961.00	3,623.67
General expenses	368,965.50	404,170.00	271,356.70	203,517.77
General expenses, salaries	329,900.00	344,000.00	300,409.49	310,927.11
Weather Bureau stations on M. and T. Bay Isles, in Lake Huron	15,000.00	.....	9,862.24	.....
Total, Weather Bureau	913,660.72	951,100.00	773,218.64	667,918.91
Grand total	2,542,060.72	2,603,500.00	2,176,895.53	1,780,530.70

In view of certain recent changes in the system of telegraphing in connection with the work of the Weather Bureau, there was a saving during the fiscal year 1894 over 1893 of $12,519.21, or about 8 per cent. The amounts paid during these years for the purpose of telegraphing were as follows:

For the fiscal year 1893	$158,666.69
For the fiscal year 1894	146,147.48
Difference	$12,519.21

APPROPRIATIONS FOR 1894 AND 1895.

The following table presents in detail the various sums appropriated, and their object, for the United States Department of Agriculture for the fiscal years 1894 and 1895. It will be seen that there is a decrease in the total amount for 1895 over 1894 of $104,476.94, notwithstanding the addition of one new appropriation, "nutrition," and that the seed fund has been increased by $30,000 to provide for the publication of farmers' bulletins:

Table showing the amounts appropriated for the fiscal years 1894 and 1895, together with the increase or decrease in the various sums, and total footings for each.

Appropriations, 1894 and 1895.	Amount appropriated, 1894.	Amount appropriated, 1895.	Increase.	Decrease.
Salaries	$256,800.00	$243,600.00		$13,200.00
Collecting agricultural statistics	110,000.00	110,000.00		
Botanical investigations, etc	30,000.00	30,000.00		
Investigating the history and habits of insects	20,300.00	20,300.00		
Investigations in ornithology and mammalogy	17,500.00	17,500.00		
Pomological information	5,000.00	5,000.00		
Microscopical investigations	2,000.00	2,000.00		
Vegetable pathological investigations, etc	20,000.00	20,000.00		
Laboratory	21,900.00	14,900.00		7,000.00
Fiber investigations	5,000.00	5,000.00		
Report on forestry	20,000.00	20,000.00		
Illustrations and engravings	2,000.00	15,000.00	$13,000.00	
Purchase and distribution of valuable seeds	135,400.00	165,400.00	30,000.00	
Document and folding room	2,000.00	2,000.00		
Experimental gardens and grounds	31,500.00	29,500.00		2,000.00
Museum	4,000.00	3,000.00		1,000.00
Furniture, cases, and repairs	10,000.00	10,000.00		
Library	3,000.00	6,000.00	3,000.00	
Postage	5,000.00	5,000.00		
Nutrition investigations		10,000.00	10,000.00	
Contingent expenses	25,000.00	25,000.00		
Agricultural experiment stations	25,000.00	25,000.00		
Inquiries relating to public roads	10,000.00	10,000.00		
Experiments in the manufacture of sugar	20,000.00	10,000.00		10,000.00
Irrigation investigations	6,000.00	6,000.00		
Quarantine stations for neat cattle	15,000.00	12,000.00		3,000.00
Bureau of animal industry	850,000.00	800,000.00		50,000.00
Total	1,652,400.00	1,622,200.00	56,000.00	86,200.00
WEATHER BUREAU.				
Salaries	179,530.00	164,290.00		15,240.00
Fuel, lights, and repairs	9,700.00	8,000.00		1,700.00
Contingent expenses	13,700.00	10,000.00		3,700.00
General expenses	404,170.00	347,338.06		56,831.94
General expenses, salaries	344,000.00	347,195.00	3,195.00	
Total, Weather Bureau	951,100.00	876,823.06	3,195.00	77,471.94
Grand total	2,603,500.00	2,499,023.06	59,195.00	163,671.94

A detailed statement is here given of the appropriations for the current year and the various sums as estimated for the ensuing year, together with the divers changes as suggested in the estimates of appropriations for 1896.

Table showing in detail the amounts appropriated for the United States Department of Agriculture for the fiscal year 1895 and the various sums as estimated for the fiscal year 1896, together with differences as proposed in the several items.

Appropriations.	Amount appropriated 1895.	Amount estimated for 1896.	Increase.	Decrease.
Salaries, officers and clerks	$213,600.00	$209,320.00		$4,280.00
Messengers, laborers, mechanics, etc	20,000.00	20,000.00		
Additional assistants in laboratory	10,000.00	10,000.00		
Collecting agricultural statistics	100,000.00	110,000.00	$10,000.00	
Investigating foreign demands for United States agricultural products	10,000.00	(*)		10,000.00
Botanical investigations and experiments	30,000.00	25,000.00		5,000.00
Investigating the history and habits of insects	20,300.00	20,000.00		300.00
Investigations in ornithology and mammalogy	17,500.00	17,500.00		
Pomological information	5,000.00	6,000.00	1,000.00	
Microscopical investigations	2,000.00	2,000.00		
Vegetable pathological investigations and experiments	20,000.00	20,000.00		
Laboratory	6,000.00	4,000.00		2,000.00
Rent of laboratory buildings	900.00	900.00		
Investigation of soils	3,000.00	5,000.00	2,000.00	
Adulteration of food	5,000.00	5,000.00		
Fiber investigations	5,000.00	(†)		5,000.00
Report on forestry	20,000.00	25,000.00	5,000.00	
Illustrations and engravings	15,000.00	15,000.00		
Purchase and distribution of valuable seeds	130,000.00	(†)		130,000.00
Farmers' bulletins	30,000.00	50,000.00	20,000.00	
Printing	5,400.00	6,000.00	600.00	
Document and folding room	2,000.00	2,000.00		
Experimental gardens and grounds	29,500.00	26,000.00		3,500.00
Museum	3,000.00	3,000.00		
Furniture, cases, and repairs	10,000.00	10,000.00		
Library	6,000.00	6,000.00		
Postage	5,000.00	2,000.00		3,000.00
Nutrition investigations	10,000.00	15,000.00	5,000.00	
Contingent expenses	25,000.00	25,000.00		
Agricultural experiment stations	25,000.00	30,000.00	5,000.00	
Inquiries relating to public roads	10,000.00	10,000.00		
Experiments in the manufacture of sugar	10,000.00	10,000.00		
Irrigation investigations	6,000.00	8,000.00	2,000.00	
Quarantine stations for neat cattle	12,000.00	12,000.00		
Bureau of Animal Industry	800,000.00	800,000.00		
Investigations and experiments with grasses and forage plants (new)		15,000.00	15,000.00	
Investigations in relation to agricultural soils (new)		15,000.00	15,000.00	
Total	1,622,200.00	1,539,720.00	80,600.00	163,080.00
WEATHER BUREAU.				
Salaries	164,290.00	164,290.00		
Fuel, lights, and repairs	8,000.00	8,000.00		
Contingent expenses	10,000.00	10,000.00		
General expenses, salaries	347,195.00	347,195.00		
General expenses, miscellaneous	347,338.06	331,125.00		16,213.06
Total, Weather Bureau	876,823.06	860,610.00		16,213.06
Grand total	2,499,023.06	2,400,330.00	80,600.00	179,293.06
Total amount appropriated for 1895				2,499,023.06
Total amount estimated for 1896				2,400,330.00
Difference				98,693.06

* Added to statistics. † Omitted.

REGULATIONS GOVERNING FINANCIAL TRANSACTIONS, ETC.

On July 1, 1894, in compliance with your instructions, regulations governing the financial transactions with the United States Department of Agriculture were formulated with a view to the establishment of new and improved methods governing the conduct of business with the Division of Accounts. At the same time, and in harmony with the regulations, a new series of vouchers were adopted and issued, intended and calculated to greatly facilitate and simplify all business transactions with this office and to expedite the settlement of the accounts with the United States Treasury.

A new form of schedule for furnishing the Department with annual supplies has also been prepared and adopted. In this connection I am pleased to report that all contracts for supplies for the current fiscal year show greatly reduced rates, the prices of nearly all items ranging lower than those of any preceding year. This reduction in price will effect a very large saving to the Department during the present year.

These schedules are as follows: Stationery, laboratory, lumber, fuel, painters' material, plumbers' material, ice, forage, car seals, tags, etc., brooms, brushes, soaps, toweling, etc., flowerpots, cleaning carpets and washing towels, telegraph, flags, and miscellaneous, with an infinite variety of items.

A statement has been prepared for the Secretary's report for 1894 showing the objects and amounts of the several appropriations, the disbursements, unexpended balances, reference to the Statutes at Large, etc., for the United States Department of Agriculture from 1878 to 1893, inclusive. This table will prove of special significance to all persons interested in the development of the Department. It will probably cover a dozen printed pages, and will be a complete showing of all sums appropriated therefor, and their disposition, from its inception to the termination of the fiscal year 1893. I would respectfully suggest that a full statement of all appropriations for the support of the United States Department of Agriculture, from the year 1839 to the present, be prepared by this office on the lines of the above, to appear in pamphlet form for ready reference and for general distribution.

In closing this report I am gratified to state that the work of the Division of Accounts and Disbursements has been kept fully up during the year, notwithstanding that the clerical force has been reduced at intervals by the transfer to other divisions of three persons with salaries aggregating $4,400, exclusive of eight other employees whose salaries amounted to $7,280, transferred from the Weather Bureau branch of the division when reorganized early in the fiscal year just closed.

The present force of the division is composed of capable and experienced clerks, is well organized, and is sufficient for the prompt and efficient dispatch of all work pertaining to the office. Under the system now in operation the work will be simplified, while certain checks and safeguards have been added for the better protection of Government property and to guard against the inadvertent violation of any statute relating to the expenditure of public funds.

REPORT OF THE CHIEF OF THE DIVISION OF MICROSCOPY.

SIR: In compliance with the Secretary's letter of July 27, I have the honor to report on the work of this division for the fiscal year ending June 30, 1894.

Respectfully,

THOMAS TAYLOR.
Chief.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

Owing to the great demand made by correspondents for special information and for the reports on edible mushrooms and their cultivation, at least one-fourth of the time of the division has been employed in answering letters and in attending to other details of clerical wokr. Over two thousand letters have been received and answered. Six thousand franks have been written for outgoing reports. Sixty colored sketches have been made from freshly-gathered specimens of the mushroom family, illustrating American species; some of which are intended to accompany future reports.

For the purpose of giving assistance to amateurs in mushroom culture, experiments have been made, and are still in progress, to ascertain the best mode of growing mushroom spawn of French and English types. In the interests of mushroom culture as a new farm industry, and for its successful propagation, the range of temperature, amount of moisture, condition of soil, and nutriment required will be ascertained and reported.

COMMERCIAL VALUE OF MUSHROOMS.

From late English advices, it is ascertained that mushroom cultivation is successfully prosecuted in the open air in Great Britain, and that growers dispose of their crops by the ton at prices varying from 10 to 25 cents per pound, wholesale. The price at wholesale in the large cities of the United States is from 60 to 75 cents per pound.

Mushroom canning and the manufacture of mushroom catchup are lucrative industries in Great Britain, as well as in continental Europe, China, and Japan. These countries export large quantities of canned mushrooms and mushroom catchup to the United States.

MUSHROOM POISONING.

In answer to many inquiries concerning the effects on man of the toxic substances of some mushrooms, especially of the *Amanita muscaria*, a wild mushroom of the woods, a report has been prepared giving the most reliable information obtainable on this subject, together with remedies to be used in cases of mushroom poisoning; also interesting accounts of symptoms from several physicians who have suffered from

muscarin poisoning, with the statement, in one instance, that relief was afforded in thirty minutes by a dose of sulphate of atropine.

By request of the State botanist of New York, a plat of duplicate models from the Columbian Exposition exhibit of prominent types of edible and poisonous mushrooms has been prepared for the State museum at Albany, N. Y. By a special request of the founder of the Jefferson County Library and Museum, at Fairfield, Iowa, a second plat of these duplicate models has been forwarded to that institution.

BUTTER AND FATS, INVESTIGATIONS.

Several samples of butter-like substances, supposed to be oleomargarine, because of their peculiar character, have been examined for the official chemist of the city of Baltimore. While the substances appeared like butter to the unassisted eye, they proved, under the chemical test for pure butter, to be very deficient in volatile fatty acids common in normal butter. Examined by polarized light, the samples appeared like normal butter, but when boiled, and crystallized by cooling, they exhibited crystals common in oleomargarine. Further careful microscopical investigation, using polarized light, demonstrated that the samples were butter notwithstanding. Butter of this character may be also detected by means of reagents used in this division for detecting cotton-seed oil, which, in the presence of cotton-seed feed, produces a scarlet-pink color in a petroleum solution of butter, and a light-straw color in the same solution, in case of alfalfa, or the ordinary cattle food.

The butter of a cow fed on cotton-seed cake appears like normal butter under polarized light, and like oleomargarine only when boiled and cooled. Oleomargarine always exhibits a crystalline structure under polarized light, because of its fats having been subjected to heat in the process of manufacture. This fact should not be overlooked; otherwise an innocent dealer may be prosecuted for selling a pure butter because, by a chemical test, it appears to be an oleomargarine. It is proposed to further investigate this subject.

Over 300 microphotographs have been made of the crystals of butter and the food fats, both animal and vegetable. These have been framed, and are on exhibition in the museum of this Department.

OIL TESTS (NEW).

A series of experiments have been instituted to ascertain by new methods the natural characteristics of certain native oils, notably olive, cotton-seed, peanut, linseed, etc., especially as regards their respective color reactions, degree of solubility of each in absolute alcohol, their relative viscosity and power of absorbing oxygen at ordinary temperatures. The samples of oils, in each case, have been received direct from cultivators and refiners of oils, who have guaranteed the purity of the respective samples. These experiments have a direct relation to new methods of detecting adulterations in the interests of agriculture and horticulture.

COTTON-FIBER MEASUREMENTS.

Nearly two thousand very careful measurements of the length of fibers of the cotton staple, domestic and foreign, have been made, and the average length, together with the maximum and minimum lengths of the fibers of the respective samples, are recorded.

Added to these special lines of divisional work there is a constant demand for examinations of a miscellaneous character—sometimes for *the public* and sometimes for the other divisions of this Department.

REPORT OF THE OFFICE OF FIBER INVESTIGATIONS.

SIR: I have the honor to report on the operations of the office of fiber investigations for the year ending June 30, 1894.

Respectfully,

CHAS. RICHARDS DODGE,
Special Agent in Charge of Fiber Investigations.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

During the first four months of the year I was under detail to the bureau of awards, of the World's Columbian Exposition, and was therefore absent from Washington. During the time, however, I made a careful study of the fibers of many countries, and was able to secure not only valuable information, but specimens for the Department museum. In this connection I may state that the museum collection of fibers has since been thoroughly overhauled, the worthless material eliminated, and the collection largely augmented by new material, all of which has been systematically classified and arranged in two divisions: The bast, or stalk, fibers, including flax, hemp, jute, etc.; and the leaf and palm fibers, such as sisal hemp, manila hemp, cocoanut fiber, etc. The specimens have been carefully labeled and catalogued with both scientific and common names. Material has already been brought together for the preparation of a descriptive catalogue, in which will be enumerated the principal fibers of the world, with very condensed accounts of their history and uses. Such a publication is a desideratum, as there is no such work in existence that is in any way complete, or fully correct in relation to American fiber plants.

Small experiments with the cultivation of Italian hemp and with the sunn hemp of India were undertaken in the spring of 1894. Seeds for the two experiments were sent to a dozen or more experiment stations and to private persons who are interested in the growth of fibrous plants. The results in cultivation can not be known until the end of the growing season, although some fine growths of stalks have been received from several localities.

The flax straw produced in the Puget Sound region of Washington was retted and prepared in April and May under my direction. The work being new to the local experimenters, was not as skillfully performed, however, as I had hoped, though the results were encouraging, and a grade of flax produced, the best of which is worth 10 cents per pound. Practical flax spinners who examined the fiber were satisfied that with more careful treatment the straw would have produced a fine quality of flax. Since my last report there have been further inquiries from foreign buyers looking to this country as a source of future supply. I must refer again to the fact of a diminishing supply in foreign flax-

growing countries, even Ireland showing a recent marked decrease in acreage, and to the advantage which would accrue to the farmers of many sections of this country from the cultivation of flax for fiber, the wheat depression making it important to add new crops to our agriculture.

Report No. 6, on the uncultivated bast fibers of the United States was prepared for publication in the spring of 1894, and was issued about the close of the fiscal year.

I have also been actively engaged in the preparation of a report on ramie. It will present a careful review of the worlds' experience in cultivation, with cost of establishing plantations, reliable figures of yield, etc.; also an account of recent progress in the industry. The present demand for such information by the public, and the widespread interest in the subject, necessitates the publication of an authoritative report.

Regarding the work of the current year, I suggest further and more comprehensive experiments with flax culture in the Puget Sound region of Washington, the small experiment of last year, which was conducted at an expense of less than $200, having been only preliminary. I consider a comprehensive experiment important, as the experience of last year showed, that with greater care, the production of a high grade of flax is possible, particularly as the climatic conditions of the region more nearly resemble those of Ireland, where the best flax is grown. Small quantities of Riga and Belgian flaxseed will need to be imported for this experiment to insure best results. The experiment will be conducted on the cooperative principle, farmers in the locality aiding the Department in the work. I would suggest the expenditure of $1,000 in this experiment, or such part thereof as may be needed. Similar cooperative experiments have been considered with Southern fibers, such as ramie and jute, and some of the leaf fibers. In the past year many requests have been received for more authoritative information regarding these fibers than the Department has been able to supply, as much of the past investigations work has only been preliminary, and performed at comparatively small outlay above the traveling expenses of the special agent in charge.

It is important that the Department shall cooperate in the proposed trials of ramie machines, which will be conducted in New Orleans during the last week of September, in which at least one foreign machine will compete. In other countries these trials are always conducted under government auspices in order that the publication of the results may have official sanction. Trials of ramie machines attract international interest, as the successful decortication of ramie is a world's problem. The recent renewal of the interest in ramie culture in Jamaica has only served to stimulate inquiry in our own country, and the Department is looked to as the source of reliable information in the United States upon the subject.

In closing I beg to refer to the fact that at no previous time has there been such a demand from the public upon the office of fiber investigations for expert information touching upon every phase of the fiber industry, and particularly from those interested in establishing new industries upon a commercial basis. There is also an increasing demand for the reports of the office, and it is particularly flattering that the demand has not been confined to our own country, but has extended to many foreign countries which are vitally interested in fiber culture. The work of the Department in this direction has had the unqualified endorsement of foreign officials and experts interested in the promotion of new fiber industries.

REPORT OF THE CHIEF OF THE DIVISION OF AGRICULTURAL SOILS.

SIR: I have the honor to submit herewith, in accordance with the recent order of the Secretary of Agriculture, a report of the work of the Division of Agricultural Soils for the fiscal year ending June 30, 1894, and a plan of the work for the current fiscal year.

Respectfully,

MILTON WHITNEY, *Chief.*

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

WORK OF THE YEAR.

The division was established by order of the Secretary, February 15, 1894, and a chief was appointed March 3. Two thousand dollars was set aside from the lump fund for the general expenses of the Weather Bureau, under the item "investigations of the relation of climate to organic life," and the services of two assistants was also allowed from the same fund. A clerk was detailed from the office of the Secretary.

Quarters had to be fitted up for the division in the upper floor of the Agricultural building and an equipment put in for office and laboratory work. As the establishment of the division was a recognition of an essentially new line of investigation on what may be called the relation of the climatology of the soil, and especially of the conditions of soil moisture and heat to the growth and development of crops, plans had to be formulated and the whole work of the division started with few or no precedents to follow. Furthermore, there were no trained assistants who could be called upon to help in the organization of the work, as it had hitherto been a much neglected line in the matter of research by scientific men and of education in our colleges. It was considered advisable, therefore, to defer the permanent organization of the force of the division until the plans could be formulated and the work started and somewhat generalized. This, it was thought, would enable us better to determine what assistants would be required and to recognize something of the kind of training they must have had to adapt them to the different lines of work they should be required to perform. During the four months which remained of the fiscal year after the chief of the division was appointed, it was scarcely possible to do more than equip the laboratory and put it in running order and to get the methods of the examination of soils well in hand. Nevertheless, much work of a permanent nature was accomplished.

The plan of work adopted embodied (1) an investigation of the soils and soil conditions in the most important agricultural, geological, and geographical areas of the country; (2) an investigation to determine

the reasons for special adaptation of these soils to crops; (3) investigations to determine how, by methods of cultivation or manuring, conditions existing in soils should be changed in order to increase their productiveness, when from their origin, composition, or texture, as well, perhaps, as from the past experience of farmers, they are judged capable of a greater productiveness than they exhibit under present conditions of climate and cultivation, and (4) a line of work to determine how the conditions existing in certain soils should be so modified as to adapt them to the production of other more profitable crops than are at present grown upon them. These, it must be admitted, are difficult problems, which will require much time and study to settle.

The work involves two essentially distinct lines of investigation—

(1) The establishment of the actual conditions of moisture and heat maintained by the different soils at the disposal of crops. When these conditions actually prevailing in soils are known, and those which are essential to the proper development of the principal crops are established, a comparison of actual existing conditions with those which are necessary for the proper development of any particular crop will show how the conditions within the soil must be changed to adapt it to the successful and economical production of that crop. The study of these conditions which actually prevail in the soils must be carried on through continuous observation in the field. Instruments must be located in representative soils for the study of the actual conditions of moisture and heat maintained by them.

(2) The second feature of the work has in view an examination of carefully selected samples of the soil in the laboratory to determine its texture, that is, the relative amount of sand, silt, and clay, the amount of organic matter, and especially the relative arrangement of these grains, as all of these conditions influence the relation of soils to moisture and the amount of moisture the soil will maintain under given climatic conditions.

Both lines of work were started in a very substantial way during the four months of the fiscal year ending June 30, 1894, including three agricultural interests—the tobacco and truck lands of the East and the arid lands of the West.

Samples of the soils and subsoils have been carefully collected from numerous localities in these different regions, and many of them have been carefully analyzed and examined in the laboratory.

With this preliminary work for a basis a number of stations were established in these different areas, and twenty-five observers have daily reported the conditions of moisture in the soils of their immediate locality during the crop season. The locations of these observing stations have been selected as representing large and important areas of land and uniform soil conditions. A full and detailed report of the methods employed and the results of this work will be prepared later, showing that important results have been obtained as to the cause of the adaptability of crops to soils and as to conditions which are essential to the best development of crops. Much credit is due for the successful prosecution of this work to the observers who have cooperated and who by their intelligent and faithful work have contributed largely to the success of the investigations.

PLANS FOR THE FISCAL YEAR ENDING JUNE 30, 1896.

The character of the work will be the same as for the current year as outlined in the first part of this report. It will include a continuation of the study of the actual conditions of moisture in the soils of

some of the most important agricultural regions of the country, together with an examination in the laboratory of the texture and physical conditions of these lands. The work should be continued in the tobacco and truck areas and extended into the cotton, corn, and wheat areas, as well as into localities devoted to horticultural purposes. The investigations of the conditions of the soils of the arid region should be continued and largely extended, as it is believed that very important results can be obtained there.

To carry on these investigations and to allow for the natural expansion of the work the force should be enlarged. It is very essential that a number of observation stations should be established in the important soil formations and observations be regularly made throughout the growing season upon the conditions of moisture and temperature of the soil, and possibly on the evaporation from soil and upon other meteorological phenomena.

REPORT OF THE LIBRARIAN.

SIR: In accordance with your order of July 19, accompanying order for submission of estimates, I have the honor to submit the inclosed report and suggestions for the library for the fiscal year ending June 30, 1894. The delay in submitting this report is due to the fact that a copy of the above order has never reached me.

Very respectfully,

W. P. CUTTER, *Librarian.*

Hon. J. STERLING MORTON,
Secretary.

During the past fiscal year new methods have been introduced in the work of the library. A dictionary catalogue on modern lines has been started, containing entries of authors and subjects. The shelves have been overhauled, duplicates weeded out, and the books rearranged on a regular system. The shelf list has been made partially available as a classed catalogue by copying it on cards. Nearly 1,000 volumes have been sent to the Public Printer for binding, and a large number of others have been made ready. Two bulletins have been issued, giving a list of accessions and a list of current periodicals and papers.

Attention is respectfully called to the fact that every other scientific library under the Government has the privilege of binding books in other materials than those required by law to be used in the general binding for the Departments. This privilege should be extended to the library of this Department, as the materials now used are not suited to books intended to be permanently preserved, and books bound in these materials will require rebinding.

The appropriation for the fiscal year ending June 30, 1895, should be continued for the following year. The literature of science is so voluminous, and the range of subjects treated by the several divisions of the Department so great, that a smaller appropriation would affect the efficiency of the scientific work of the Department in no small measure. To keep in touch with the work of others in related lines, scientific workers should have a large fund available for the purchase of matter in which this work is published.

REPORT OF THE POMOLOGIST.

SIR: I have the honor to submit my first report as pomologist of this Department.

S. B. HEIGES, *Pomologist.*

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

WORK OF THE DIVISION.

During most of the year the work of the division was mainly confined to the identification of specimens received, the examination and description of and reporting upon new varieties sent by their originators for that purpose, the disposition of correspondence on various subjects relating to fruit culture, and other current work.

It is endeavored to make an accurate description and outline drawing of each new-named variety received and also of each specimen of the well-known varieties which exhibits a marked variation from its type. Nearly three hundred of these descriptions have been made during the year. Though the labor involved is considerable, the accumulated material resulting from it is found to be of great value in identifying and comparing varieties. This material will eventually be available for publication. Colored illustrations of the more promising varieties received are also prepared both for office use and future publication. The employment of a modeler has made possible the addition of many desired varieties to the Department collection of fruit models. The collection exhibited at Chicago was loaned to the board of management of the Midwinter Fair at San Francisco, to remain during its continuance. It will hereafter be retained in the Department museum for the use of the division.

Numerous new and promising varieties of fruit were placed with experimenters during the year, through the medium of scions or plants donated by their originators. Through the courtesy of the Royal Horticultural Society of England a collection of fig cuttings was secured, comprising the sixty-five varieties which have been found most valuable in the society's gardens at Chiswick. This collection is believed to be the most carefully and accurately named one in existence. It was secured for the double purpose of introducing valuable varieties new to this country and of providing a means of correcting the confused nomenclature that exists in regard to this fruit. The scions were forwarded to California, where they were grafted on established stocks in order that they may be brought into fruiting at the earliest possible date. Plants will be propagated from them for distribution.

During the latter part of the year the interrupted tabulating of data received in reply to circulars of inquiry previously issued was resumed, and good progress is now being made in the preparation of reports for publication.

The importance of furnishing to the public correct information regarding the injury to the prospective fruit crop by the severe frosts of the last week of March was recognized, and a special investigation of the subject was made by the pomologist. The result of this investigation was published as a part of the monthly report of the statistician for May, and widely circulated through the horticultural press. In addition to the statistical information furnished, the point that certain groups or families of the peach bloom habitually later than others, was clearly brought out, thus indicating what varieties are most likely to escape injury by late frosts in the Southern and Eastern States. It is unfortunate that the latest bloomers thus far discovered belong to the early ripening group of white-fleshed semiclings, of which Alexander and Hale are well known varieties, the fruit of this type of peach being of comparatively little value for table use or market. The search for late-blooming varieties yielding fruit of good quality will be continued.

The work of the special agent upon the revised catalogue of fruits has continued during the year and is approaching completion.

PROSPECTIVE WORK.

In order that the work of this division may assume greater accuracy and be placed upon a more scientific basis, the following lines of investigation should be adopted:

Varietal fruit herbarium.—The province of this section should be, in addition to the modeling of the same variety of fruit, differing widely in color, form, size, texture, and flavor, resulting from soil, climate, elevation, and culture, to collect and preserve foliage, young and fruiting wood, with blossoms whenever possible, for the purpose of comparison and more thorough identification. This would necessitate procuring presses for the purpose of preparing and cases for the preservation of these specimens. A skilled person could in the course of a few weeks during the blossoming season collect and classify the foliage, wood, and blossoms of all varieties of fruits of deciduous trees and form a herbarium of immense value in a few years.

There should also be provision for photographing types of the various forms of growth, as it is a well-established fact that most varieties assume an individual habit of growth. Pruning may somewhat modify this natural tendency, but under the various systems of pruning, or the entire absence of pruning, the type will still manifest itself. So few of those who describe verbally the habits of growth have a knowledge of the pyramidal, the erect, the spreading, the dependent, the close, the open forms, that their descriptions are of little value in identifying varieties.

Photographs of these various forms reproduced in the annual report would go far in establishing uniformity and accuracy of description. The various forms of pruning and training the vine could thus be illustrated at very little expense, and object lessons of this character would render the subject more intelligible than any other method of instruction.

If I comprehend aright the scope of this division it is not only to impart information upon present needs, but also to look forward to a higher degree of proficiency in all phases of fruit culture. The entire additional expense of this departure need not exceed $1,000 for the first year and a less amount would be sufficient for succeeding years.

The cases, presses, and photographic apparatus would be sufficient for many years.

In a few years a pomological museum could be organized that would court the admiration of the world.

REPORT OF THE CHIEF OF THE DIVISION OF GARDENS AND GROUNDS

SIR: I have the honor to submit herewith a report for this division for the year ending June 30, 1894.

Respectfully, WILLIAM SAUNDERS,
Chief of Division of Gardens and Grounds.

Hon. J. STERLING MORTON,
Secretary.

The character of the work in this division is largely of a routine nature, consisting in part of the care and keep of the roadways, lawns, trees, and shrubbery, and of the 40 acres of reservation occupied by the Department, every square foot of which requires periodical attention.

The glass structures cover a surface a little over three-fourths of an acre, all containing plants, which of course require daily attention and labor in watering, repotting, and the general care which such collections must have, if kept in health.

Several of these structures are employed for the propagation of plants, some of which are used for the embellishment of the grounds, the larger portion being used for propagating various economic plants for distribution throughout the States.

The plants propagated and distributed during the past year number 75,000, which have been packed for transmission by mail.

Expenditures for salaries.

Watchmen	$2,220.00
Carters	1,560.00
Stablemen	1,920.00
Greenhouses, propagating and packing department	6,300.00
Foreman	1,400.00
Clerk	1,000.00
Laborers	6,710.00
Mechanics	2,700.00

Miscellaneous.

Packing moss and peat	150.00
Plants and bulbs	2,066.17
Paint and glass	151.63
Lumber	268.99
Concreting	1,460.89
Flower pots	51.25
Plumbing	156.47
Labels	60.00
Drayage and expressage	163.10
Hardware	308.66
Steam boiler (new)	445.59
Fertilizers and insecticides	118.70
Sand, soil, and gravel	146.50
Hose	228.30
Oiled packing paper	29.75
Coal vault (new)	267.27
Paper boxes for packing	62.50
Repairs	39.80

Expenditures for the present fiscal year will be somewhat reduced in regard to salaries; according to present rating about $3,000 less will be required, as compared with the past fiscal year. With reference to miscellaneous expenditures, it is not possible to make exact estimates, as exigencies may occur, requiring outlays which can not be foreseen, in the line of repairs to glass structures and heating apparatus, as well as in other matters constantly liable to tear and wear. But the amount appropriated for all these purposes will be amply sufficient to meet these exigencies unless they are of an extraordinary nature.

ESTIMATE FOR JULY, 1895, TO JULY, 1896.

Labor in experimental garden and grounds, the care of conservatories, plant and fruit propagating and seed-testing houses, for building and repair of greenhouses, and the keep of the reservation, lawns, trees, roadways, and walks, $18,000; blacksmithing, the purchase of tools, wagons, carts, harness, horses, lawn mowers, heating apparatus, and machinery, and the necessary labor and material for repairing the same; the purchase of new and rare kinds of seeds, plants, and bulbs for propagating purposes; expense of material and labor in labeling and packing plants for distribution and transportation; the purchase of necessary pots, tubs, watering cans, and hose; the purchase of material for the destruction of insects, and other necessary items for the cultivation and improvement of the grounds and arboretum; material and labor for repairing and making roads and walks; the purchase of glass, paints, lumber, tin for roofing and spouting, and hardware, and for expenses of carpenters, painters, and all other mechanics, and the necessary material for keeping the conservatories and other structures in good repair, $11,000.

REPORT OF THE CHIEF OF THE PROPERTY AND STATIONERY DIVISION.

SIR: I have the honor to submit for your consideration a report of this division for the year ending June 30, 1894.

Respectfully,

D. M. HALL,
Chief Property and Stationery Division.

Hon. J. STERLING MORTON,
Secretary.

This division was created recently by the consolidation of two divisions—one previously known as the property division and the other as the stationery division—and has during the past year been under my charge.

As chief of the property division, pursuant to your instructions, I made a complete inventory of all the property of the Department, and from this have made a classified list, a copy of which is deposited in the office of the chief clerk. This schedule is amended from time to time, as additions are made by purchase, or as property is changed from one division to another, or eliminated by disbursement or condemnation.

In the stationery division, from which the various kinds of stationery and supplies for daily and general use of the Department are disbursed, a minute inventory of goods on hand was taken at the time I was given charge. In addition to a statement of stock then on hand, I am able at very short notice, at any time, to report to the chief clerk the amount of goods bought since, and the cost of same; also an account with each division that shows how the goods have been disbursed. Nothing is given out from this division except on written requisition, signed by the chief of the division requiring the supply and indorsed by the chief clerk.

In this connection I wish to say, that on taking charge of the property division I found no record or other evidence that any inventory had ever been made or kept of the furniture or other property used by the Department; and in the stationery division no account of goods bought or statement of the disposition of the same was to be found.

REPORT OF THE SPECIAL AGENT FOR THE PURCHASE OF SEEDS.

SIR: I have the honor to submit my report for the year ending June 30, 1894.

Respectfully, ENOS S. HARNDEN,
Special Agent.

HON. J. STERLING MORTON,
Secretary.

In connection with my report for the fiscal year ending June 30, 1894, and complying with your request for an estimate of the amount of appropriation required for the coming fiscal year for the purchase of seeds, I have to say that I can not conscientiously recommend an appropriation for a free distribution of seeds, either valuable and improved, rare and uncommon, or any other sort.

While serving in this Department as special agent for the purchase of seeds, I have tried to put the purchasing of seeds upon a purely business basis, considering only the best interest of the Department. In the matter of the selection and purchase of seeds for the present fiscal year, the law has been complied with and the results will be found, I am convinced, to be the most satisfactory attained by the Department for many years.

In the light of my experience as a former seedsman, however, I consider the free distribution of seeds by this Department as an infringement upon and interference with a legitimate business, and I believe it should be abolished.

The seed business, whether wholesale or retail, is to-day as much an established legitimate business as manufacturing or trading in any product or merchandise. I hold that this Department has no moral right to interfere with this or any other legitimate business interest by a free political distribution of garden seeds, spades, shovels, or plows, or of new styles of dress goods, or of any other commodity the subject of legitimate trade.

Many seed firms in the United States make a specialty of putting up seeds for sale in papers and packages, and these may be purchased in the stores of every city, town, and village throughout the country. In fully four-fifths of the towns of a population of 200 and up, there are merchants who make a specialty of garden and field seeds in bulk, where farmers and gardeners can obtain fresh seeds of all descriptions by the ounce or pound. Thus garden seeds are to be had by paying for them in every section of the United States.

There are, moreover, 152 seedsmen in the country who issue catalogues that are mailed to farmers and gardeners in all the States. Many of the picture catalogues are filled with extraordinary descriptions of vegetables and tell many Baron Munchausen stories, still they give the

farmer and gardener an opportunity of ordering such seeds as they desire, and there is no reason why persons who wish to supply themselves with seeds for planting, should fail to procure new or old varieties for want of an opportunity to obtain them in a legitimate way, by paying for them.

Garden seeds are as much a part of a groceryman's stock in trade (except in city stores which have no country trade) as starch or soap, and still this Department makes no distribution of the latter or of the thousand and one items handled by the tradesman.

I readily concede that years ago the seed division did much for the agricultural interests of the country in introducing new and improved cereals and other field seeds, but at the present time, as for years past, the people who receive our free garden seeds do not, as a rule, take any advantage of the opportunity given them of saving the seed crop for their own use the following year. On the contrary, as many of the reports made to the Department on the results of planting the seeds sent simply state that "the seeds did well," "came up beautifully," "please send me some more," it is a fair inference that the recipients, as a rule, want to obtain good seeds for the least possible money.

As a matter of fact this Department has for many years been behind the seedsmen in the introduction of new varieties, and for good reasons.

First, the seed division can not carry on the business like a private individual, but is hampered by the rules and red tape which govern all Government undertakings. It is unable to make contracts in advance as seedsmen do. When a seedsman discovers a new and valuable improvement in a vegetable or plant, he nurses the stock seed from year to year until he has a stock sufficient to enable him to place it upon the market and then, when he has introduced his improved variety, the Department comes in and takes its chances on what no one else wants, after the growers and other customers have gotten their contracts made, perhaps a year or more ahead.

As there is no way of detecting if a shipment of seed be true to name without a practical test in a trial ground for that purpose, the Department of Agriculture has for years been considered the dumping ground of seedsmen, who had stocks of seed that they were afraid to send to market gardeners or other good customers. A trial ground is something that the Department does not possess, and even if it did there is no advantage to be obtained from one from a distribution standpoint, as the seeds can not be experimented with until the year following the distribution. It is shown by the books that the Department has year after year distributed the same old varieties under new names, doubtless supposing the same to be new to the country. In this the Department, like hundreds of individuals, has been imposed upon, and will continue to be imposed upon to a greater or less extent while the distribution is continued, until it takes up the subject systematically, and, by an experimental ground, settles the question of true varieties and synonyms.

To illustrate: In the 152 catalogues issued by the different seedsmen of this country for 1894, there were 222 varieties of cabbage listed, while actually there are not more than 30 distinct varieties in this country. The same state of affairs exists in all the families of vegetable and field seeds sold by seedsmen; we have, for instance, 235 names representing different varieties of lettuce, 228 of peas, etc., when in fact there is not over one-fourth that many actual varieties. The improvements in most cases are in the manner of putting up or in an improved *way of weighing out* the seed, and the prices asked for these are from

10 per cent to 50 per cent higher than those asked for the same thing under its proper name. I feel assured that the Department of Agriculture can do the people, the gardeners, and the farmers more actual good by making such tests of varieties and publishing the results of the same at an expenditure of $15,000 than with ten times that amount for free seed distribution.

Moreover, the settling of this question will be of great benefit to honest and reliable seedsmen, and will, I believe, meet with the approval of every seedsman in the United States who is not a fakir.

In conclusion, therefore, I suggest that the purchase of seeds for free distribution by this Department be discontinued, and I earnestly recommend that, in place thereof, $15,000 be appropriated for the purpose of determining the distinct kinds and varieties of vegetable and field seeds and their synonyms, the result obtained from these experiments to be published in the series of farmers' bulletins of the Department.

REPORT OF THE SUPERINTENDENT OF THE DOCUMENT AND FOLDING ROOM.

SIR: I have the honor to submit for your consideration a report on the work of the Document and Folding Room for the fiscal year ending June 30, 1894.

Respectfully, WILL H. BANE,
Superintendent Document and Folding Room.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

The manual work has been almost doubled, very largely owing to the increased number of publications that have been issued in the past year. This work, I am proud to say, has been accomplished with neatness and dispatch and with a less force than the year preceding. The system of keeping a record of each publication that is mailed from this division enables me to state that there was treble the amount of mail matter distributed the past year than there was the year before. And it is a matter worthy of note to call your attention to the fact that this work was accomplished with less money than it has taken in the past, as I had some of my appropriation returned to the Treasury.

The correspondence of the division has increased, but is being handled admirably with the efficient clerical force. I am at present recompiling the entire mailing lists of the Department, and am free to say that the task, while an arduous one, will be of great benefit to the Department when finished. There are many names duplicated on the lists, and their elimination requires an experienced compiler. As an instance of the duplication of names, it is noted that where there was a general distribution of one of the popular publications I found one address that received twelve copies.

In conjunction with the document and folding division there has been added a complete rubber-stamp factory, and where it used to take the Department at least ten days to get a rubber stamp manufactured, the same can now be accomplished in a few hours under our process, and at less cost. The gentleman having charge of the plant is an experienced mechanic and understands the business thoroughly. There have also been purchased two patent mailing machines that will facilitate the addressing of the Department, the favorable results of which can only be computed when given an unbiased trial.

I trust that the work of this office is being run upon the principle you so wisely advocate.

REPORT OF THE SPECIAL AGENT AND ENGINEER FOR ROAD INQUIRY.

SIR: I have the honor to submit herewith a report of the operations of the Office of Road Inquiry from the date of its institution, October 3, 1893, to June 30, 1894.

Respectfully,

ROY STONE,
Special Agent and Engineer.

Hon. J. STERLING MORTON,
Secretary.

The Office of Road Inquiry was instituted by you on October 3, 1893, in pursuance of the act of Congress containing the following provision:

To enable the Secretary of Agriculture to make inquiries in regard to the systems of road management throughout the United States, to make investigations in regard to the best methods of road making, to prepare publications on this subject suitable for distribution, and to enable him to assist the agricultural colleges and experiment stations in disseminating information on this subject, ten thousand dollars.

The work of the nine months of the fiscal year was necessarily tentative, but I was successful, by availing myself of voluntary aid, in gathering at small expense (as prescribed in your letter of instructions) the information published in Bulletins Nos. 1 to 9, inclusive, and much more that will be available in future. The following is a list of the bulletins:

No. 1. State Laws Relating to the Management of Roads. Enacted in 1888-1893. Compiled by Roy Stone, special agent.

No. 2. Proceedings of the Minnesota Good Roads Convention, held at St. Paul, Minn., January 25-26, 1894.

No. 3. Improvement of the Road System of Georgia. By O. H. Sheffield, C. E., University of Georgia.

No. 4. Report on Road-Making Materials in Arkansas. By John C. Branner, Arkansas State geologist.

No. 5. Information Regarding Road Materials and Transportation Rates in Certain States West of the Mississippi River.

No. 6. Information Regarding Roads, Road Materials, and Freight Rates in Certain States North of the Ohio River.

No. 7. Information Regarding Roads and Road-Making Materials in Certain Eastern and Southern States.

No. 8. Earth Roads: Hints on their Construction and Repair. Compiled by Roy Stone, special agent.

No. 9. State Aid to Road Building in New Jersey. By Edward Burrough, State commissioner of public roads.

These bulletins have been in such demand that the first editions have in many cases been exhausted, and the second of No. 1 is nearly so.

In addition to the literary work of the office, I have attended and addressed many conventions and meetings, relative to road improvement, and have assisted by request in preparing road laws for several States.

The expenditures for the year are—

For salaries	$2,177.85
Traveling expenses and sundries	808.93
Total	2,986.78

For the current year it will be profitable to increase the work of the office, and with your approval I propose to extend it on the same lines, and also to compile progress maps of all the improved roads in the United States.

No arrangement has yet been made for the cooperation of the agricultural colleges, and I shall ask authority to send out one or more lecturers to address the students of those institutions and public bodies or meetings.

REPORT OF THE CHIEF OF THE OFFICE OF IRRIGATION INQUIRY.

SIR: I have the honor to submit herewith my report of the business of the Office of Irrigation Inquiry for the fiscal year ending June 30, 1894.

Very respectfully, CHARLES W. IRISH,
Chief.

Hon. CHAS. W. DABNEY, Jr.,
Assistant Secretary.

The work of this office for the fiscal year 1893–94 was confined principally to a correspondence with parties engaged in farming by irrigation in the arid and semiarid regions of the United States. This correspondence covered a wide range of subjects pertaining to practical irrigation. In order to gather a knowledge of irrigation methods and results, a circular letter of questions covering the round of crops raised by irrigation, and other practical subjects connected therewith, was sent, to the number of about 4,000, to the farmers, managers, and engineers engaged in irrigation farming. There were received in reply a large number of letters descriptive of the construction and operation of irrigation systems and of farm returns, which will furnish a valuable basis for the future work of this office.

For the purpose of gaining a more intimate and extended knowledge of irrigation operations than could be attained by means of correspondence, I was authorized by the Secretary of Agriculture to travel through California, Arizona, New Mexico, Nevada, and Utah, and spent the months of January, February, and March, 1894, in those regions. A large amount of information was gathered on this trip regarding irrigation methods and resulting farm products; and many works in the shape of dams and reservoirs for impounding water; and canals with their head works, distributing gates, division works, and weirs, were inspected, and the engineering plans of the same secured for use in the office. The subject of irrigation by means of artesian water was inquired into, as a large number of artesian wells were encountered on the way. In Arizona and New Mexico the underflow of streams was thoroughly examined into, for the reason that in the valley of the Santa Cruz River at Tucson, and of the Mimbres River at Deming, large excavations have been made down through the dry beds of these streams to the underflow level, giving an opportunity to inspect and investigate its volume. In Arizona the plan of substituting a floating steam dredge in place of men, teams, and excavating machines commonly used in canal construction, was inspected, and found to be a great advance over the methods in common use for such purpose, and altogether much cheaper than those methods.

Six hundred and fifteen letters were sent out from the office during the year conveying information relating to the cultivation of crops by irrigation methods and plans for the construction or management of irrigation canals. Twenty-nine plans were drawn in the office for irrigation works, based upon information sent me by the parties in interest. Something over half these letters were sent to the dry regions of Texas, Kansas, and Nebraska, where for the past several years the rainfall has been very deficient, and dry farming for that reason being almost out of the question. It appears from this correspondence that the people in those regions will now attempt to utilize all of the available water supply for irrigation purposes. One hundred and forty-two letters upon miscellaneous questions of irrigation were written and sent out, making the sum total of the official correspondence for the year 757 letters.

Bulletin No. 1 of this office was published by authority of the Secretary of Agriculture, it being an Abstract of the Laws of the Several States and Territories on Irrigation and Water Rights. Of this bulletin, 368 copies have been sent to parties requesting it. There have also been sent to parties requesting them 250 volumes of the former reports of this office. As the supply of these reports for the office was long since exhausted, I procured from various members of Congress the 250 volumes above mentioned.

The expenses of the office for the fiscal year 1893–94 were $5,463.02, of which amount $4,831.69 were paid in salaries, $615.33 disbursed for traveling expenses, and $16 for stationery.

The increasing demand for information regarding the practice of irrigation, coming principally from the semiarid regions, calls for an extension of the work of the office during the current fiscal year on the lines as practiced for the past year.

It will be well, in order to lesson the labor of writing out standard instructions, to print such in leaflets or pamphlet form for distribution to those who call for them. This information is sought by those who have never seen irrigation practiced, and who know of no other source from which to obtain it, and who, from their crop failures of the past two years and their surroundings, need it very much.

In order that a complete knowledge of irrigation operations in the United States shall be obtained, the chief of the office should be authorized to travel in the States of Utah, Idaho, Wyoming, the two Dakotas, Montana, Oregon, Washington, Colorado, Kansas, and Nebraska, it being only by personal inspection that a correct knowledge can be obtained of the questions growing out of the use of the waters of the interstate streams flowing through the before-mentioned States—questions which are every day growing in importance.

On such trips, the amount of rainfall and snowfall on the watersheds of such streams can be inquired into, and arrangements made looking toward a careful gauging of the flow from them, a most important matter to be known, and as yet not attempted.

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